

OPERATION, MAINTENANCE, AND MONITORING PLAN

VOLUME 1

General Requirements and Surface Systems

Prepared for:

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DOCUMENTS INCORPORATED BY REFERENCE

(MAINTAINED IN LANDFILL OFFICE)

- Bridgeton Landfill Health and Safety Plan
- Security and Access Control Program
- Quarterly Infrastructure Update
- Construction Quality Assurance Plan, by Aquaterra Environmental Solutions, Inc., December 2004
- EVOH Cap System QA/QC Plan, Cornerstone Environmental Group, April 2013
- Construction Documentation Report, 2013 Temporary Cap and Cap Integrity System, by Weaver Boos, October 2013
- 2013 Stormwater Management System Record Documentation Report, by Weaver Boos, October 2013
- Odor Management Plan
- Incident Management Plan
- Gas System Monitoring Equipment Manuals
 - Envision Operating Manual
 - Water Level Meter User Manuals
 - Four-gas Personnel Monitoring Meters
 - Flame Ionization Detector
 - Temperature Monitoring Equipment
- Other documents are listed in the body of this OM&M Plan

1.0 INTRODUCTION

1.1 BACKGROUND

Bridgeton Landfill LLC (Bridgeton Landfill) is located on a 214-acre parcel, of which approximately 52 acres has been permitted for municipal solid waste disposal under the conditions of Permit #118912. In accordance with the permit, waste was placed in former limestone quarries which were reportedly about 240 feet deep. The landfill ceased accepting waste at the end of 2004.

In December 2010, Bridgeton Landfill detected changes in gas extraction well conditions, specifically, elevated temperatures and elevated carbon monoxide levels were detected. Further investigation indicated that the landfill was experiencing an exothermic subsurface reaction (SSR) which, among other effects, increases the potential for fugitive emissions and odors from the facility. Since the time that the subsurface reaction was confirmed, Bridgeton Landfill has worked with the Missouri Department of Natural Resources (MDNR) Solid Waste Management Program (SWMP) along with other local, state and federal agencies to respond.

This Plan is a living document that will be modified as site infrastructure and conditions change. Section 8.0 of this volume describes the process for making future modifications to the OM&M Plan.

1.2 PURPOSE OF OPERATION, MAINTENANCE, AND MONITORING PLAN

The presence of an SSR requires enhanced monitoring and maintenance so that containment and control systems continue to operate efficiently. The purpose of this Operation, Maintenance and Monitoring (OM&M) Plan is to prescribe a detailed and rigorous set of procedures to:

- Create a document that can be implemented by in-house Bridgeton Landfill personnel and/or by a third party to maintain effective, safe, environmental management of the facility;
- Perform regular inspection and maintenance of environmental control, conveyance, and containment systems;
- Enable tracking of the status of the SSR, and provide facility personnel with information needed to contain and manage its byproducts (including sampling and analyses of landfill gas and leachate);
- Provide monitoring to assess the reaction condition including status/progression of the SSR, as indicated by settlement surveys and stability inspections;

- Identify issues and conditions that warrant agency notification (such as significant and sudden data changes, slope movements, or surface fires) and that may require or be conducive to further remedial measures; and,
- Present means for communication, reporting, and revision of the OM&M Plan as conditions warrant.

To meet these objectives, Bridgeton Landfill has prepared this three-volume OM&M Plan, supplemented by other on-site documents, structured as indicated below:

- **Volume 1 – General Requirements and Surface Systems (this volume)**
- Volume 2 - Gas and Subsurface Control Systems
- Volume 3 - Leachate Management Systems
- Miscellaneous documents/manuals incorporated by reference

This OM&M Plan document will extensively reference other documents that will be retained in hard copy format at the Bridgeton Landfill facility office including: a Health and Safety Plan (specifically designed for activities related to this OM&M Program), Incident Management Plan, Odor Management Plan, as-built drawings, equipment operating manuals, etc. The OM&M Plan will be part of the Bridgeton Landfill operations until it is agreed with the SWMP that the thermal event is no longer presenting severe operational challenges and maintenance and monitoring of the landfill can revert to the approved permit, or to a modified permit, which may include modified OM&M procedures.

1.3 OPERATION, MAINTENANCE, AND MONITORING PLAN MANAGEMENT

The OM&M Plan will be managed and administered by the following Bridgeton Landfill personnel:

- Division Manager (DM) – The primary person responsible for implementation of the OM&M Plan. Provides daily on-site management of the implementation of the Plan and is authorized to approve minor changes or deviations from the program. The Environmental Manager and Operations Manager report to the Division Manager;
- Environmental Manager (EM) – Provides daily on-site management of the implementation of the Plan. The Environmental Manager reports to the Division Manager;
- Operations Manager (OM) – Responsible for implementation of the OM&M Plan at the management level, coordinating day-to-day activities. The Operations Manager reports to the Division Manager;

- Environmental Specialists (ES) – Responsible for implementation of the OM&M Plan at the field level. The Environmental Specialists report to the Environmental Manager or the Operations Manager;
- Field Technicians – Bridgeton Landfill or third party personnel that perform the operation and maintenance activities in the field. The Field Technicians report to the Environmental Specialists, Operations Manager, or the Environmental Manager; and,

Actual staffing levels, skills, assignments, and work hours vary with conditions and activities.

Since site features may change and future remedial features may be required to further manage and mitigate the effects of the SSR, this OM&M Plan will be a living document that is amended, as necessary, as site features are installed, abandoned, or changed. Significant changes to procedures or requirements of this OM&M Plan will be submitted to the SWMP for approval and then, upon approval, will be reflected in the revised Plan to be retained on site as described in Section 8.0.

2.0 INSPECTION, MITIGATION, AND REPAIR

As a matter of routine, Bridgeton Landfill technicians perform multi-system inspections early each regular workday morning (Monday through Friday excluding holidays). These inspections are called “Quad-Checks” and are meant to identify items that are, or could develop into, immediate odor or environmental containment issues. Detailed locations (schematics showing quad areas), procedures, and documentation processes for Quad-Checks are presented in Appendix A. Each day (including weekends and holidays) a perimeter inspection is performed. Procedures for these perimeter inspections are also presented in Appendix A.

Issues involving potential odors or leaking liquids are reported to the Operations Manager, Environmental Specialist, or Environmental Manager in a timely manner, and corrective procedures in Table 1 are implemented. Every possible effort is made to eliminate an odor source as soon as possible and no later than the end of the day. If a major repair or structural change is required, the issue will be timely reported to the Operations Manager or his designee, who will generate a non-routine work order to resolve the issue. Records of such identified issues and their resolution or repair are documented in work orders and/or technician field books that will be retained on site.

2.1 SECURITY AND SURVEILLANCE

The Bridgeton Landfill facility is rigorously secured and monitored. A Security and Access Control Program is incorporated into this OM&M Plan by reference. Highlights of the measures include items such as:

- Perimeter fencing enclosing the entire property;
- Gated access points;
- Surveillance cameras monitoring site access 24 hours per day;
- Video monitoring of the cameras available at the site office and the leachate treatment plant; and,
- 24/7 on-site staffing trained to perform routine perimeter inspections and implement procedures outlined in the Incident Management Plan.

3.0 COVER SYSTEMS

Prior to the current SSR conditions, the facility had installed the clay final cover required by its permit. However, in order to contain and manage symptoms of the SSR, Bridgeton Landfill has covered about 45.542 acres with exposed flexible membrane liner (FML) EVOH cover over the entire South Quarry Area and most of the North Quarry.

Approximate current locations of final clay cover and of the EVOH, as well as the major site features, are indicated on Figure 1 of this OM&M Plan. Detailed as-built locations and conditions of the EVOH cover are contained in the current Quarterly Infrastructure Update and other construction record documentation on site.

3.1 FINAL CLAY COVER AREAS

Final clay cover at the facility is comprised of at least 24 inches of compacted clay over waste and 12 inches of soil for vegetation (this is the only cover system that is currently on a small portion of the North Quarry area). The final clay cover is subject to normal erosion and vegetative stress. As needed, hydroseeding is performed to maintain adequate vegetative cover, reduce erosion rills, and enhance maintenance of the clay cap. Appendix A – Site Inspections includes daily inspection and Table 1 provides repair procedures for clay final cover areas.

Final clay cover (that is not EVOH cover) repair QA/QC will be performed in accordance with the Aquaterra Environmental Solutions, Inc. document titled “Construction Quality Assurance Plan,” dated December 2004, and retained on-site. This document includes the QA/QC requirements to achieve the requirements of the facility’s operating permit regarding final clay cover. Major repair areas, covering greater than 0.5 acres, will be documented and shown when appropriate on updated as-built drawings. Documentation and as-built surveys are not required for minor repairs.

3.2 EVOH COVER AREAS

3.2.1 EVOH Membrane Material

EVOH refers to exposed flexible membrane liner material placed over areas where control of gas and/or odors may need to be enhanced (this cover system is currently on the South Quarry area and a majority of the North Quarry in addition to and on top of the final clay cover described in 3.1 above). Appendix A – Site Inspections includes daily inspection and Table 1 provides repair procedures for EVOH final cover areas.

Major repairs or new installation of EVOH cover QA/QC will be performed in accordance with the Cornerstone Environmental Group document titled “EVOH Cap System QA/QC Plan”. This document is retained on-site and includes the QA/QC requirements for subgrade preparation, subcap leachate collection, landfill gas collection components and geosynthetic materials and installation. Safety Data Sheets (SDS) sheets for HDPE and EVOH cap materials are contained in Appendix B.

When applicable, the standard details included in the OM&M Plan will be used to guide the repair process. Major repair areas will be delineated with an as-built survey, documented, and added to the active as-built drawings of the EVOH cover. Documentation and as-built survey are not required for minor repairs which include seam or rip repairs, patches, gas well or structure boot repairs, etc.; such repairs will be noted in daily logs and field books, which are retained on-site.

3.2.2 Subcap Features

Subcap features were installed with the cap membranes. These features are sometimes referred to as “cap integrity systems” and are intended to prevent gas from collecting under the unweighted membrane causing “ballooning,” and to collect subcap leachate and condensation to prevent accumulation at the toe of the slope. Subcap drains are indicated on the as-built infrastructure drawing as 4-inch perforated trench drains. Procedures for inspecting and repairing subcap drains are included in Table 1.

3.2.3 Subcap Voids and Cracks

When localized settlement and subsidence occurs, site personnel erect caution tape (or equivalent) around the area as necessary for safety purposes. The areas of subsidence are monitored until the area is repaired in order to prevent safety hazards; and the cover and localized collection are maintained to prevent release of gas or leachate in order to avoid any increase in odors related to the settlement. Settlement areas that result in a gas or leachate release are repaired as promptly as possible in order to prevent any increase in odors. Two alternate procedures for repairing localized settlement and cracks are presented in Appendix C.

3.2.4 Large Settled Areas

Reaction-related settlements are creating low areas which can collect surface water and cause “bellies” in gas and air lines, reducing or obstructing their function. These areas comprise too much volume to correct with the procedures used for crack and void filling.

These settled areas can occur over several acres and may ultimately require many feet of fill to attain grades which allow surface water drainage and efficient gas management. Surface water that collects in these areas can be readily and easily addressed by pumping non-impacted water out of the low areas after a rainfall; impacted stormwater will be conveyed to the leachate pretreatment facility. In some cases, it is necessary to fill the large settled areas with clean fill as defined at 260.200.1(6) RSMo or soil¹ to restore grades for the piping networks and to promote surface water drainage. Typical procedures for placement of fill on EVOH synthetic cap material are contained in Appendix D.

¹ As of this writing, this definition is “uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinderblocks, brick, minimal amounts of wood and metal, and inert solids as approved by rule or policy of the department for fill, reclamation, or other beneficial reuse.”

4.0 SURFACE WATER MANAGEMENT SYSTEMS

Precipitation runoff from the cover system enters the surface water management system and is then conveyed off-site. Schematic representation of the surface water management systems are illustrated on Figure 2. Detailed as-builts for these features are contained in the record documentation on-site. The cover and surface water management system must work together to minimize surface water ponding on the landfill, and to prevent erosion and surface water contamination. The facility is currently subject to NPDES Permit No. MO-0112771; permitted outfalls are indicated on Figure 2.

The term “surface water management system” refers to those ditches, swales, culverts, and ponds that are outside of the limits of waste disposal, but that convey stormwater runoff from the landfill proper. If any condition arises (e.g. a spill occurs) that creates a threat to the surface water, Bridgeton Landfill may construct a containment feature between the threat location and a surface water detention or retention pond (see Figure 2).

In several areas, surface water can be retained using an isolation valve should a leachate leak or release be detected on the EVOH cover surface; locations of such isolation valves are indicated on Figure 2. Normally, the valves are all kept closed to arrest movement of surface water contamination should it occur. However, whenever rain begins or is imminent, facility personnel shall perform an inspection of the synthetic cap and ditches to assure no leachate is present on the surface, and then open the valves to allow normal flow-through operation of the surface water management features.

At or near each on-site culvert, “pigs” or pipe plugs are located for rapid plugging and isolation of a spill prior to reaching the isolation valves. In addition, if an active or potential leak is identified, soil berms are used to trap the liquid before it can reach the ditches, culverts, or isolation valves.

Should a leak or release of contaminated water or leachate occur, it will be handled in accordance with Appendix B of the facility Incident Management Plan (Spill Prevention and Response for Leachate), which is incorporated into this OM&M Plan by reference. Leaks or spills that exceed 55 gallons will be logged with a report of date, time, location, approximate volume, and corrective actions taken; this information will be provided in the Monthly Data Report.

5.0 ODOR MANAGEMENT AND NOTIFICATION

Procedures for work-day, on-site detection and remediation of odor causing issues is described in Section 2.0 of this Plan. In addition, Bridgeton Landfill has an “Odor Management Plan” (OMP), which is incorporated into this OM&M Plan by reference. The OMP contains procedures for self-inspection around the perimeter of the landfill, investigations of odor complaints, management and abatement of odor, record keeping, and reporting related to odor management.

Facility staff is responsible for providing prior notification to the SWMP, St. Louis County, and the Pattonville and Robertson Fire Protection Districts of routine maintenance or planned major replacements, extensions, changes or new installations occurring at the facility in sufficient time to allow for advance notice to be provided to the surrounding community when such work is expected to result in elevated odors extending beyond the property boundaries of the facility and that may enter the community.

6.0 MONITORING AND DATA COLLECTION

6.1 MONITORING PROGRAM OBJECTIVES

The following monitoring objectives have been identified:

- Monitor status/progression of the SSR with specific attention paid to movement into or through the neck into the North Quarry;
- Monitor for and abate odors related to the SSR;
- Monitor characteristics and volume of leachate and gas;
- Maintain gas collection and leachate collection efficiency;
- Assess conditions requiring notification, repair, further evaluation, or corrective action with specific attention to rapid settlement and slope movement/instability; and
- NSPS – Title V air regulation compliance.

Note that perimeter environmental monitoring (e.g., groundwater, gas migration, and air quality monitoring) is not addressed in this OM&M Plan because it is governed by other facility permit and compliance documents. Some of the monitoring described in the following sections is performed using instrumentation and procedures that are more thoroughly described or presented in Volume 2 or Volume 3 of the OM&M Plan.

Monitoring results will be presented in Weekly and Monthly Data Submittals as outlined in the following sections. In addition to these reports, on Friday of each week, Bridgeton Landfill will report to the MDNR a list of work completed in the past week and work planned for the following week.

Non-routine sampling, i.e., sampling that is not done to support OM&M efforts, or not included in an approved work plan, will require at least 48 hours of advance notice to the MDNR unless an emergency response requires sampling on a more expedited basis, in which case Bridgeton shall notify the MDNR via the emergency phone line 573-634-2436. Final QA/QC data collected by Bridgeton or its agents in support of the reports will be maintained at the facility and available upon request to the MDNR.

6.2 SETTLEMENT SURVEYS

A third-party contractor will perform ground surveys as set forth in Table 2 using GPS methods which will obtain northing, easting, and vertical elevations with an anticipated accuracy of ± 0.1 ft. vertical and ± 0.05 ft. horizontal.

Lateral progression of atypical settlement rates and return to typical settlement rates may indicate in which direction the SSR is advancing or retreating, respectively. This information can be valuable for the planning and installation of preemptive remedial measures; such measures could include adjustments to the operation and/or location of temporary cap system, gas collection piping, and leachate transmission piping.

The results of the survey will be presented on a figure in the Monthly Data Submittal as well as the data files as described in Section 7.0. Bridgeton Landfill personnel will compare the survey results with previous months to help determine the rate of settlement and a summary of the results will be provided monthly to the MDNR.

Additionally, a quarterly Stability Assessment will be performed by a professional engineer. The purpose of the assessment will be to visually identify any stability or settlement issues of concern and will include an evaluation of the perimeter of the landfill for evidence of settlement, slip, or separation of waste from the quarry high wall. If issues of concern are noted, Bridgeton Landfill will notify the MDNR and evaluate appropriate next steps, which may include enhanced monitoring via pin monitoring, toe monitoring, or other agreed technology or approach.

6.3 GAS WELL FIELD DATA

Data collected in the field allows the operator to make immediate adjustments to gas wells for improving gas collection efficiency, and may provide data that indicates the conditions within the landfill waste mass. Procedures used to monitor all gas well field points are the same regardless of the point's purpose or designation (e.g. GEW, GIW, SEW, etc.). The purpose and description of these various structures are provided in Volume 2 of this OM&M Plan.

All GCCS monitoring (gas concentrations, temperature, pressure, and flow rate) shall be performed using an instrument with GPS capabilities so that the coordinates of the monitoring point are recorded and stored with each reading, providing an audit trail for the monitoring. Separate recording of coordinates and monitoring data is not permitted. Approved meters include the Landtec GEM units and Elkins Earthworks Envision meter or as otherwise approved or accepted in the industry and the meter used for collection of data should be included with the submitted data.

All GCCS field monitoring equipment must meet the following minimum requirements:

1. Infrared sensor technology for CH₄ and CO₂ measurement;
2. Electrochemical sensor for O₂ measurement;
3. Temperature probe to measure the temperature of the gas stream;

4. Internal pressure sensors to measure static, system, and differential pressures;
5. Ability to be calibrated in the field;
6. Ability to store measured data and user defined comments electronically; and,
7. Data shall be exported via a .csv file.

Procedures for instrument calibration, use, and data collection are provided in Volume 2 of the OM&M Plan.

Gas well field data results will be collected at the frequency specified in Table 2, and will be presented in the Monthly Data Submittals as described in Section 7.0.

The facility is subject to the NSPS regulations. Permit #OP2010-063 requires gas wells to meet certain limits and, if the limits are exceeded, dictate timelines to return to compliance or obtain permission to exceed the limits, unless approved alternate operating parameters exist for the gas well. See Volume 2 for additional detail.

6.4 GAS WELL LAB-ANALYZED GAS PARAMETERS

At times, a gas extraction well may not be suitable for sampling for lab-analyzed gas parameters. Bridgeton Landfill shall provide written notice within 5 days after any sampling event period if wells are not flowing with liquid-free gas or are determined to be unsafe for gas sampling using a condensed version of Table 3.

6.4.1 South Quarry

Gas samples will be collected from functional and accessible gas extraction wells in the South Quarry as specified in Table 3 at the frequency specified in Table 2. Laboratory analyses will be performed for hydrogen, carbon monoxide, methane, oxygen, carbon dioxide, and nitrogen using analytical testing method ASTM D-1946 (Standard Practice for Analysis of Reformed Gas by Gas Chromatography).

6.4.2 North Quarry and Neck Area

Gas samples will be collected from each functional and accessible gas extraction well in the North Quarry area at the frequency specified in Table 2. Laboratory analyses will be performed for hydrogen, carbon monoxide, methane, oxygen, carbon dioxide, and nitrogen using analytical testing method ASTM D-1946 (Standard Practice for Analysis of Reformed Gas by Gas Chromatography).

Procedures for obtaining and analyzing these samples are contained in Volume 2 of the OM&M Plan. Results from these laboratory analyses will be presented in the Monthly Data Submittal as described in Section 7.0. Upon installation of future wells, Figure 3 will be used to identify wells as Neck Area, North Quarry, or South Quarry wells for inclusion in the assigned sampling routine once operational.

6.5 LEACHATE COLLECTION SUMP LIQUID LEVELS

Leachate is removed from the landfill using leachate collection sumps (LCS) at seven locations. These LCSs were designed for insertion of a pump near the base of the landfill. Further description of the operation of these pumps is provided in Volume 3 of the OM&M Plan.

The LCS wells in the South Quarry penetrate deeply into the waste mass, possibly into and through the suspected reaction areas. As a result, subsurface temperatures well above the boiling point may exist and cause steam and liquid ejection that cannot be controlled or managed with a pump. In such situations, the LCS is equipped to collect gas and liquids which appear in the wellhead but conditions are not acceptable for monitoring. These wells will be observed and, if the ejection ceases, equipped with a pump.

When conditions do allow, and a pump is present and operating within the LCS, leachate levels are indicated by pressure transducer readout at the pump location. These levels will be collected at the frequency specified in Table 2 and will be reported in the Monthly Data Submittals.

6.6 GAS WELL LIQUID LEVELS

Results of gas well liquid level measurements may be used to determine if sufficient gas extraction well screen perforations are exposed to allow for efficient gas extraction.

Measurements are to be made with industry-standard water level indicators. The water level tape is introduced into the well via a dedicated sample location drilled and tapped into each well head assembly. This device signals water contact with a bright LED light and a buzzer. The manufacturer claims an accuracy of 1/100th of a foot. However, this reading can be highly inaccurate even when extreme care is taken by the technician. The presence of foam within the well can yield false readings. Additionally, the probe can often cling to the side of a saturated gas well casing giving a false reading. Changes to the instrument may be made including additional weighting of the probe and/or constructing a small cage to prevent probe contact with the casing in an attempt to minimize erroneous readings.

Knowledge about historical readings can be helpful to the field technician when discerning false readings. Bridgeton Landfill will continue to evaluate the accuracy of instruments; other liquid monitoring manufacturing equipment and technology could be utilized to improve reliability of these measurements.

6.7 LEACHATE VOLUME DATA COLLECTION

The volume of leachate processed by the leachate pretreatment facility and the volumes transported off site via truck and direct discharge will be reported in the Monthly Data Report. In addition, the volume of leachate removed by each of the Leachate Collection Sumps (LCSs) will be reported in the Monthly Data Submittal along with the pump type and model in service and the associated flow meter readings from the beginning and end of the reporting period.

6.8 VERTICAL TEMPERATURE PROFILES/TEMPERATURE MONITORING PROBES

Bridgeton Landfill has installed a series of temperature monitoring probes (TMPs) which consist of a set of direct-buried Type T thermocouple strings at each location. These TMPs were strategically positioned to monitor the position of the SSR with respect to the Neck Area between the South and North Quarry (see Figure 3), to evaluate performance of heat extraction, and to monitor conditions in the North Quarry.

Thermocouple tips are buried at 20-foot vertical intervals and the temperatures are used to develop vertical temperature profiles of the waste mass and/or gas within the localized waste mass. Temperature readings from direct buried thermocouples will be made using the procedures described in Appendix E. Raw Data and results of these readings in graphical format showing temperature at each thermocouple depth interval will be provided in the Weekly Data Submittal.

The landfill environment is detrimental to the lifespan and function of the TMPs, especially to those located closest to the SSR. Since installation, many of the TMP intervals have become unreliable, and more will become unreliable in the future. A determination of the reliability of a specific interval can be made using the procedures also described in Appendix E.

6.9 FLARE FIELD-ANALYZED PARAMETERS

Flow and temperature measurements are continuously monitored utilizing inline flow measurement device(s). All of the flares are permitted and flare data is recorded in accordance with the requirements of NSPS. The flow meter(s) provide continuous reading via a data recorder in accordance with NSPS regulation. See Volume 2 of this OM&M Plan for additional detail.

Flow, temperature, and gas quality data obtained as described above will be presented in the Monthly Data Submittals as described in Section 7.0.

6.10 FLARE LAB-ANALYZED PARAMETERS

Gas samples will be taken from the blower outlet (common inlet to the utility flares) at the site. Analyses will be performed for hydrogen, carbon monoxide, methane, carbon dioxide, oxygen, and nitrogen using laboratory testing analytical ASTM D-1946 (Standard Practice for Analysis of Reformed Gas by Gas Chromatography).

Results of these analyses will be presented in the Monthly Data Submittal.

6.11 DATA EVALUATION

Field-obtained data is monitored by trained Bridgeton Landfill personnel in real-time. Adjustments to the gas management system are made immediately based on the data and in accordance with procedures contained in Volume 2 of the OM&M Plan.

Analytical laboratory-obtained data is compiled by a qualified person and presented in the Monthly Data Reports as described in Section 7.0.

7.0 REPORTING

Weekly and Monthly Data Submittal contents are provided in Appendix F and G of this volume. The monitoring and reporting set forth in this document satisfy the needs of Bridgeton Landfill to address the operational challenges, monitoring, and maintenance that are a result of the SSR. SWMP and/or Bridgeton Landfill may request and mutually agree to modifications of the monitoring and reporting program.

8.0 MODIFICATIONS TO OM&M PROCEDURES AND PLAN

Implementation of this OM&M Plan will result in repair, augmentation, extension, and/or major reconstruction of landfill features. For routine maintenance issues which do not fundamentally alter or extend a feature's purpose or function (examples include moving or re-routing of landfill gas or leachate piping, raising or lowering a gas well, abandoning a gas well, repairing a portion of the cap, filling minor subcap voids or cracks, etc.) maintenance records will be kept at the facility and available for inspection by SWMP.

For major replacements, extensions, changes, substantial design revisions, and new installations, Bridgeton Landfill will consult with the SWMP. Examples include new or replacement gas wells, major filling or re-capping projects, fundamental changes to the gas destruction system, or significant changes to the surface water management system. If necessary, Bridgeton Landfill will submit for approval of a permit modification providing documentation, work plan and schedule, as well as any associated modifications to the OM&M procedures. A registered engineer licensed in the State of Missouri is required to seal these documents. If modifications need to be made on an emergency basis to protect human health or the environment, this will require immediate notification of such changes to the SWMP pursuant to the facility's permit. Should field conditions prevent installation as detailed in the approved work plan, notice will be provided by phone call and/or email to SWMP.

Facility as-built drawings are referenced in this volume and will be updated and provided to MDNR SWMP upon completion of work prescribed in the work plan, but no more frequently than on a quarterly basis.

In addition, many of the activities described in the OM&M Plan are self-implementing with no requirement for external authorizations; however, the SWMP shall be notified of significant potential or actual modifications to allow for review and approval of such change. MDNR may request or suggest changes to the Plan; such changes will be incorporated upon mutual agreement with Bridgeton Landfill. Resulting significant changes to the procedures or requirements of this OM&M Plan will be reflected in an updated OM&M Plan document to be retained on-site, and an update of such changes will be provided to the SWMP on a quarterly basis if any changes are made in the prior quarter.

Forms used to operate and maintain the facility may be revised as long as the information required by the version contained in this approved OM&M Plan is modified as to form/format and content and an update provided to SWMP on a quarterly basis if any changes are made in the prior quarter.

Updated pages or sections of the OM&M Plan will include a revision date in the lower right corner of the page, and a running diary of changes and rationale for the changes will be kept in the front of the document (see Appendix H).

9.0 CLOSURE AND TERMINATION OF OM&M PLAN REQUIREMENTS

The SSR causes accelerated thermal decomposition and reduction in volume of the solid waste. Therefore, a strong indicator of the intensity and activity of the SSR is the trend of the total volume of settlement that is occurring. Based on this indicator (see Appendix I), settlement related to the SSR in the South Quarry has slowed. Therefore, it is possible that modifications to the requirements of the OM&M Plan, as presented in Section 8.0, will be possible relatively soon. Then, over the next few years, many of the requirements in this Plan may be eliminated or modified as mutually agreed with MDNR-SWMP.

Nevertheless, this OM&M Plan will be part of the Bridgeton Landfill operations until it is agreed by the SWMP that the thermal event is no longer presenting severe operational challenges and maintenance and monitoring of the landfill can revert to the approved permit, or to a modified permit.

A formal closure letter will be issued by the MDNR after review and approval of a certification from an independent registered professional engineer verifying that closure activities have been completed in accordance with the closure plan.

TABLES

Table 1 – Inspections and Maintenance

	Item or Conditions to Be Inspected	Potential Adverse Impact	Criteria for Acceptance	Corrective Procedures	Target Corrective Timeline*
CLAY FINAL COVER	Non-uniform waste settlement in clay final cover	Ponding	No damage or significant ponding	Fill the area of significant ponding to promote sheet flow, add topsoil and reseed.	1 week
	Crevasses in clay final cover	Infiltration	No cracks(generally wider than three inches and deeper than one foot) or no visible waste exposed	Fill opening with soil compacted to meet final cover specifications, restore topsoil and vegetation. Replace damaged piping if necessary.	1 week (same day if waste is exposed)
	Liquids (leachate) breaking out of clay final cover	Surface water impact	No liquids or staining verified as attributable to leachate observed	Collect and remove liquid as soon as possible. Block liquid from entering stormwater collection channels if necessary. Once liquid is under control, excavate saturated area, install french drain if deemed necessary, and backfill with new clay and topsoil to restore original configuration.	Same Day
FML COVER	Crevasses or voids in the soil directly under the FML	Safety hazard	No significant cracks, stretched (trapolined) FML, separation, etc. observed	Determine the nature and extent of the crack upon discovery, and evaluate safety, extent, and if repair is required. Cordon area with warning tape if unsafe for foot traffic. Follow procedures in Appendix D for repair.	3 months
	Rips, tears, or punctures of the FML cap	Odor	No rips, tears, punctures, or stress observed	Extrusion weld FML repair patch (or bead for small holes) as soon as practical upon discovery. Remove, adjust or protect temporary FML cap from objects causing stress point concentrations.	Same day if causing odor. One week if no odor.
	Degradation of FML Material	Odor/Fragility	No brittleness or delamination	Extrusion weld FML repair patch (or bead for small holes) as soon as practical upon discovery. Remove, adjust or protect temporary FML cap from objects causing stress point concentrations.	Same day if causing odor. One week if no odor.
	FML boots connected to LFG wells or other penetrations	Odor	No stress or damage observed	Repair the FML boot, patch, weld, or seal	Same day if causing odor. One month if no odor.
	Liquids (leachate) below the FML cap	Liquid accumulation at toe, leachate release.	No bulging observed	Clean and jet the toe drain or subcap drain to which the collected liquid was designed to drain. Evaluate subcap drainage piping, and install additional subcap drainage piping or repair existing as necessary. Repair FML.	Same day if release imminent. One week if no release imminent.**
	LFG below the FML cap	Odor	No gas build-up (pillowing) observed	Increase vacuum to subcap LFG collectors in the area of the pillowed FML. Install surface vacuum point (bubblesucker) if necessary.	Same day

*These timelines are target goals only, which may be impacted by weather conditions, contractor availability (if needed), and safety conditions.

***Imminent” means the event is determined by the inspection to likely or possibly occur before the next regular weekday work shift will begin. Inspections will be conducted by a site technician trained by site management prior to conducting said inspections

Table 1 – Inspections and Maintenance (continued)

	Item or Conditions to Be Inspected	Potential Adverse Impact	Criteria for Acceptance	Corrective Procedures	Target Corrective Timeline*
GAS COLLECTION	Wellhead	Odor	No gas leakage or oxygen infiltration	Repair in accordance with procedures in Volume 2	Same day
	Piping	Reduced gas collection odor	No “bellies” or breaks	Repair in accordance with procedures in Volume 2	Same day
SURFACE WATER MANAGEMENT	Earthen Ditch Vegetation	Erosion	Grass health, good coverage, less than 6” long	Overseed and mulch	3 months
	Earthen Ditch Riprap	Erosion	Pieces in place, no exposed subsoil	Move or add riprap	3 months
	Ditch Clogging	Flooding	Sediment build up or other obstruction	Remove obstruction to original ditch line	Same day if significant obstruction; 3 months if mild obstruction.
	Culvert Structural Integrity	Flooding	Near circular or original shape throughout length	Remove and replace if deformation affecting capacity or collapse is imminent and caution tape should be installed around the structure if safety concern observed	1 month if significant deformation; 3 months if mild deformation.
	Culvert Clogging	Flooding	Top of corrugations visible and/or less than 3” sediment	High-volume water flush until clean	Same day if significant obstruction; 3 months if mild obstruction.
	Clay Cap Slope Erosion	Erosion	No erosion rills greater than 6” deep	Fill rill, reseed, and mulch	3 months
	Clay Cap Vegetation	Erosion	Grass healthy, good coverage, less than 18” long. No shrubs or seedlings	Overseed and mulch as appropriate, remove shrubs or seedlings, irrigate as necessary.	3 months
	Detention Pond Liner	Infiltration	No rips or seam separation	Extrusion weld FML repair patch (or bead for small holes) as soon as practical upon discovery. Document repairs in accordance with FML QA/QC Plan.	1 month
	Detention Pond Valve	Release of impacted water	Valves are not clogged and exercise freely	Jet obstructions from valve closing, lubricate workings, exercise valve.	Same day
	Detention Pond Sediment	Capacity reduction	Less than one foot accumulation	Remove with backhoe or water jet and vac	3 months
	Detention Pond Outlet	Flooding	Smooth transition from outlet pipe to ditch invert, erosion protection in place	Restore and regraded, add new rip rap as necessary.	Same day if significant obstruction; 3 months if mild obstruction.

*These timelines are target goals only, which may be impacted by weather conditions, contractor availability (if needed), and safety conditions.

***Imminent” means the event is determined by the inspection to likely or possibly occur before the next regular weekday work shift will begin. Inspections will be conducted by a site technician trained by site management prior to conducting said inspections

Table 2 – Proposed Data Collection

Proposed Data Collection	Location	Monitoring Frequency	Reporting Vehicle
Settlement Data	South Quarry and Neck Areas	Monthly	Monthly Report
Settlement Data	North Quarry	Quarterly (Note 2)	Monthly Report
Slope Stability Assessment	North and South Quarries	Quarterly	Monthly Report
Gas Extraction Well Field Parameters (temperature, oxygen, pressure, methane, carbon dioxide)	Gas extraction features (gas extraction wells, subcap collectors, leachate risers, etc.)	Per NSPS Permit Requirements-APCP Monthly-SWMP	Monthly Report
Gas Well Lab Analyzed (D-1946) (Note 1)	South Quarry GEWs (See Table 3)	Quarterly	Monthly Report
Gas Well Lab Analyzed (D-1946) (Note 1)	North Quarry and Neck Area GEWs (See Table 3)	Monthly	Monthly Report
Gas Flow Volume Measurements	Operating Flare(s)	Continuous	Monthly Report
Flare Field Parameters	Operating Flare(s)	Weekly	Monthly Report
Flare Lab Parameters	Operating Flare(s)	Monthly	Monthly Report
Leachate Collection Sump Liquid Levels	Operating LCSs	Weekly	Monthly Report
GEW Liquid Levels	Accessible vertical gas extraction wells	As needed	On-site Records
Leachate Volume	Treated at Pretreatment Plant	Continuous	Monthly Report
Leachate Volume	At each Leachate Collection Sump (LCS)	Continuous	Monthly Report
Vertical Temperature Profile	All functioning TMPs	Weekly	Weekly Report
Work Performed List	Previous week and next week	Weekly	Weekly Report
Infrastructure As-Built Drawings	North and South Quarry	Quarterly	Infrastructure Update

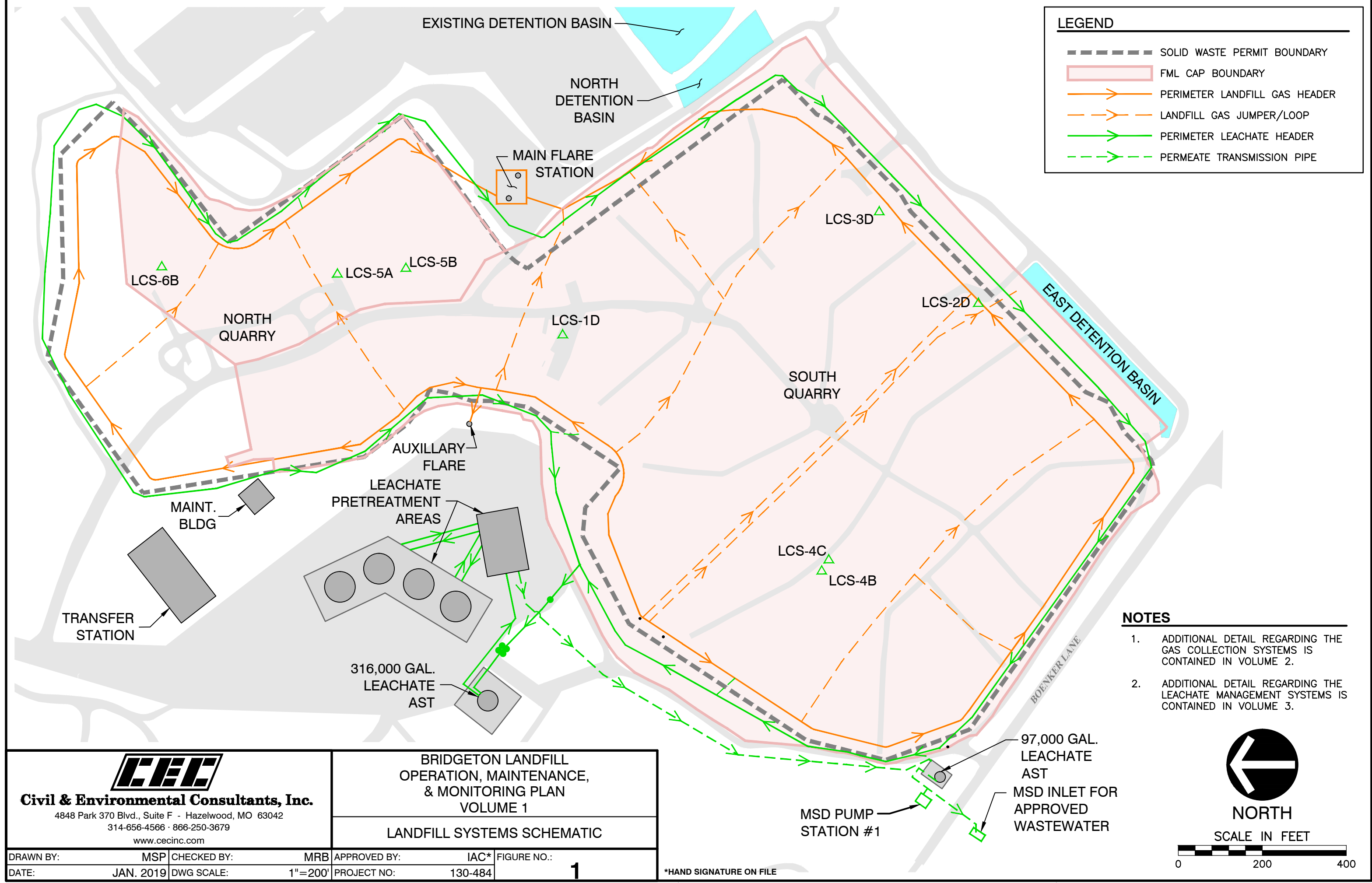
- 1) For wells that exhibit liquid-free gas flow and that are safe for gas sampling.
- 2) Should the rate of settlement at two adjacent points exceed 1.0 feet in a quarterly monitoring event, the survey frequency will be increased to monthly For the points in question and all adjacent points until quarterly differential is confirmed to be less than 1.0 feet.

TABLE 3
BRIDGETON LANDFILL
List of Gas Extraction Wells for Laboratory Testing by Location

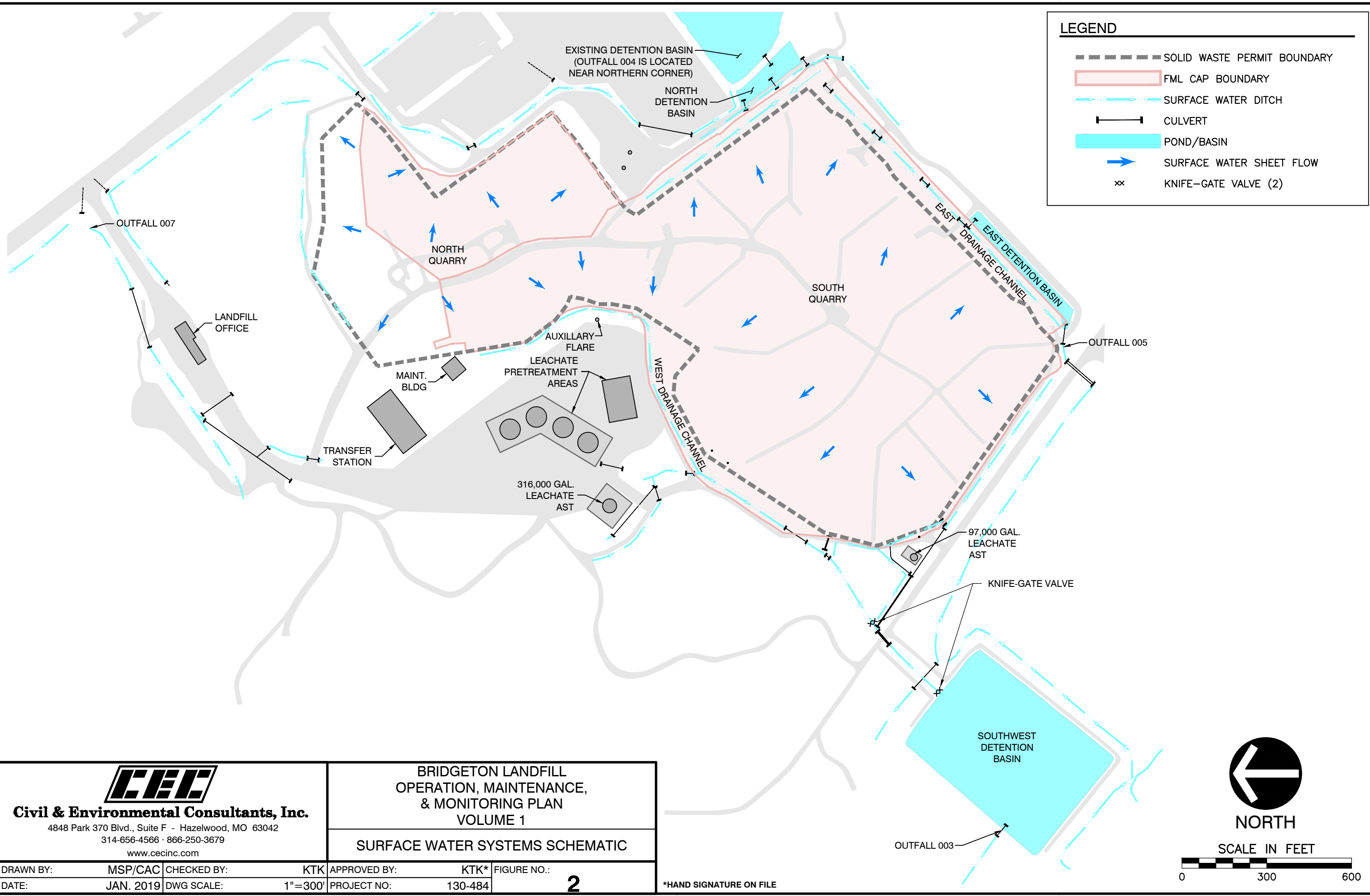
<u>North Quarry</u>	GEW-57R	GEW-142
<i>Monthly</i>	GEW-58	GEW-143
GEW-2	GEW-58A	GEW-144
GEW-3	GEW-59R	GEW-145
GEW-4	GEW-67A	GEW-146
GEW-5	GEW-68A	GEW-147
GEW-42R	GEW-77	GEW-148
GEW-45R	GEW-78R	GEW-149
GEW-46R	GEW-81	GEW-150
GEW-47R	GEW-82R	GEW-151
GEW-48	GEW-86	GEW-152
GEW-49	GEW-87	GEW-153
GEW-53	GEW-88	GEW-154
GEW-54	GEW-90	GEW-155
	GEW-91	GEW-156
<i>Bi-Monthly</i>	GEW-100	GEW-157
GEW-1A	GEW-101	GEW-158
GEW-2S	GEW-102	GEW-159
GEW-6	GEW-104	GEW-160
GEW-7	GEW-105	GEW-161
GEW-41R	GEW-106	GEW-162
GEW-43R	GEW-107	GEW-163
GEW-44	GEW-108	GEW-164
GEW-50	GEW-113	GEW-165
GEW-51	GEW-116	GEW-166
GEW-52	GEW-117	GEW-167
	GEW-118	GEW-168
<u>Neck Area</u>	GEW-120	GEW-169
<i>Monthly</i>	GEW-121	GEW-170
GEW-8	GEW-122	GEW-171
GEW-9	GEW-123	GEW-172
GEW-10	GEW-124	GEW-173
GEW-38	GEW-125	GEW-174
GEW-39	GEW-126	GEW-175
GEW-40	GEW-127	GEW-176
GEW-55	GEW-128	GEW-177
GEW-56R	GEW-129	GEW-178
GEW-109	GEW-130	GEW-179
GEW-110	GEW-131	GEW-180
	GEW-132	GEW-181
	GEW-133	GEW-182
<u>South Quarry</u>	GEW-134	GEW-184
<i>Bi Monthly</i>	GEW-135	GEW-185
GEW-13A	GEW-136	GEW-186
GEW-15	GEW-137	GEW-187
GEW-16R	GEW-138	GEW-188
GEW-18B	GEW-139	
GEW-22R	GEW-140	
GEW-57B	GEW-141	

FIGURES

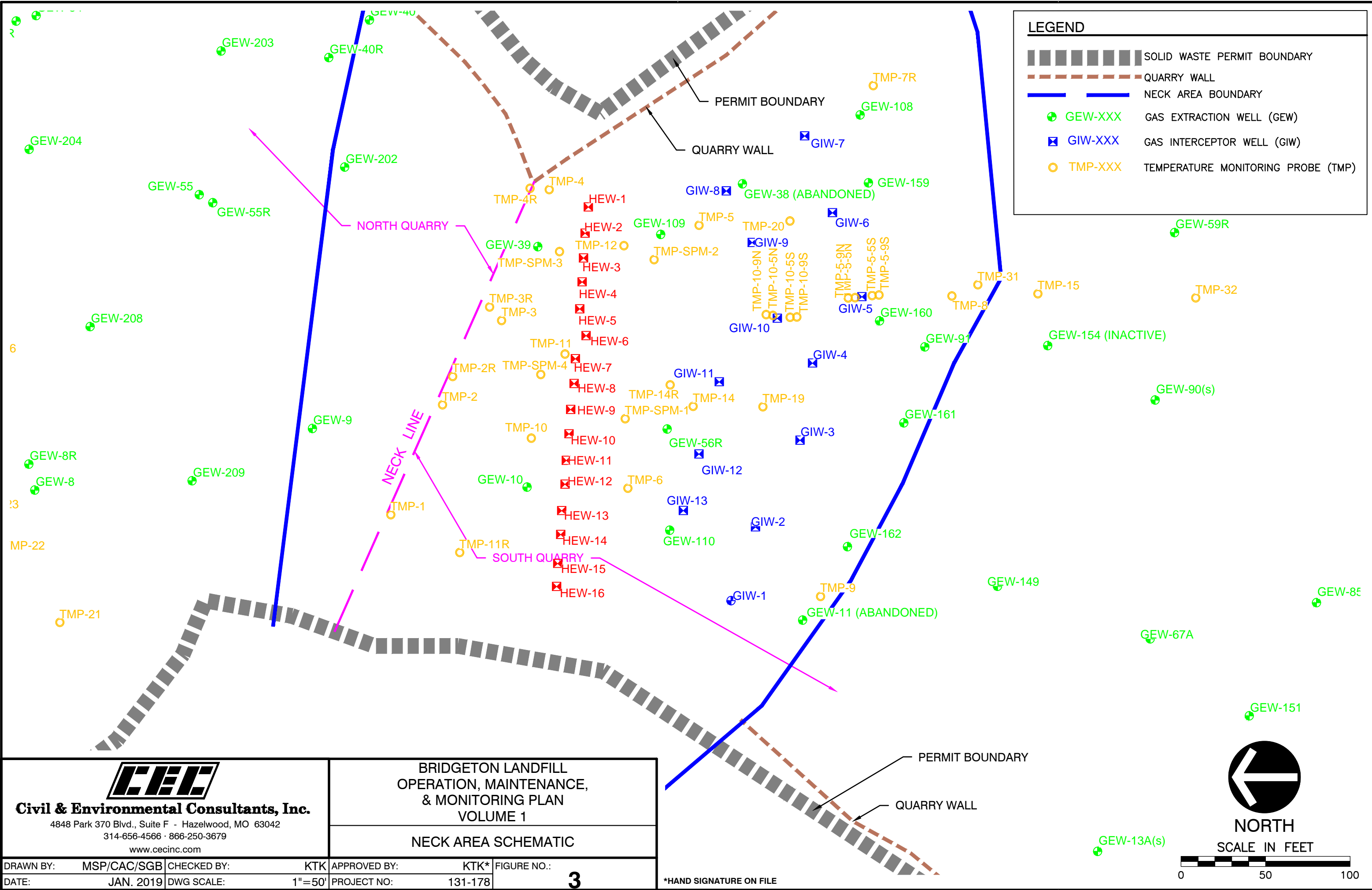
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APPENDIX A
SITE INSPECTIONS

Bridgeton Landfill Inspection Procedures

Week-Day Quad Checks

1. Attend early AM kickoff meeting to receive assignments, have safety briefing, and discuss known issues and overnight events.
2. Perform quad check using current Forms.
3. All landfill system features must be observed with up-close on-foot inspection.
4. At a minimum, those features provided on the quad check illustrations and noted on Table 1 of the Plan must be observed and assessed at each observation point.
5. Document using the Forms; any minor repairs made during quad checks, any minor repairs to be made later that same day, and any major repairs that require planning.
6. Refer to field book and/or work orders to identify open issues and follow up on repairs.
7. Communicate with adjacent quad checkers to assure that territorial overlap is achieved.
8. If an issue is creating an odor release or environmental release, immediately make appropriate repairs and/or notify Operations Manager or his designee.
9. At conclusion of quad check, provide Operations Manager or his designee with Form and assure that all unresolved issues are noted.
10. Operations Manager or his designee is responsible for consolidating quad-check issues and assuring that repairs are made in accordance with Table 1.
11. File completed Form in Operating Record on site.

Daily/Weekend/Holiday Checks

1. Perform perimeter inspection, completing "Perimeter Inspection Form."
2. If an issue is creating an odor release or environmental release, immediately make appropriate repairs and/or notify Operations Manager or his designee.
3. File completed Form in Operating Record on site.

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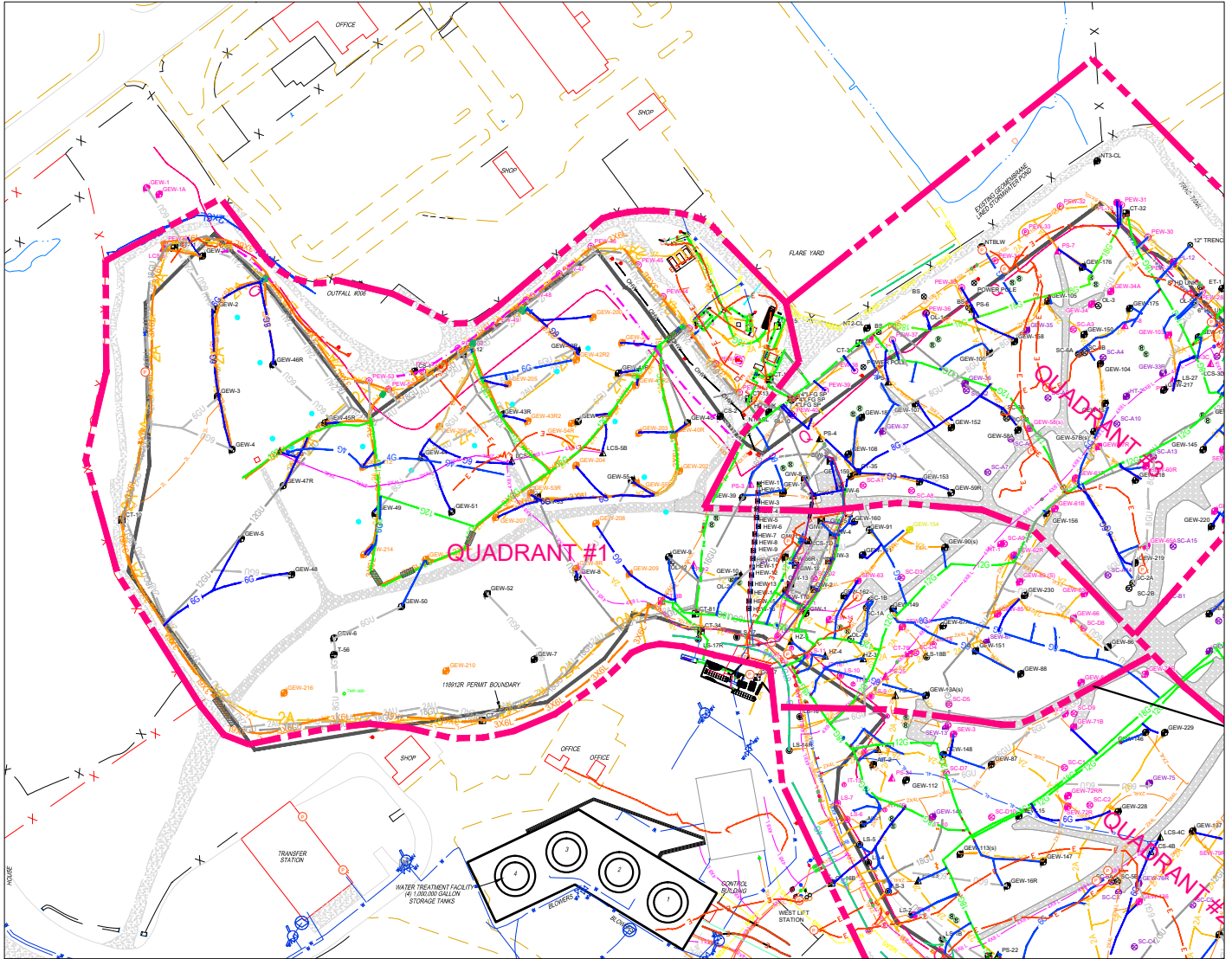
INSPECTION KEY - January 2019

BRIDGETON LANDFILL QUADRANT CHECKS

BLQ1-(DATE)_____

INSPECTOR NAME: _____

QUADRANT #1



REPAIRS:

ODORS:

PUMPS:

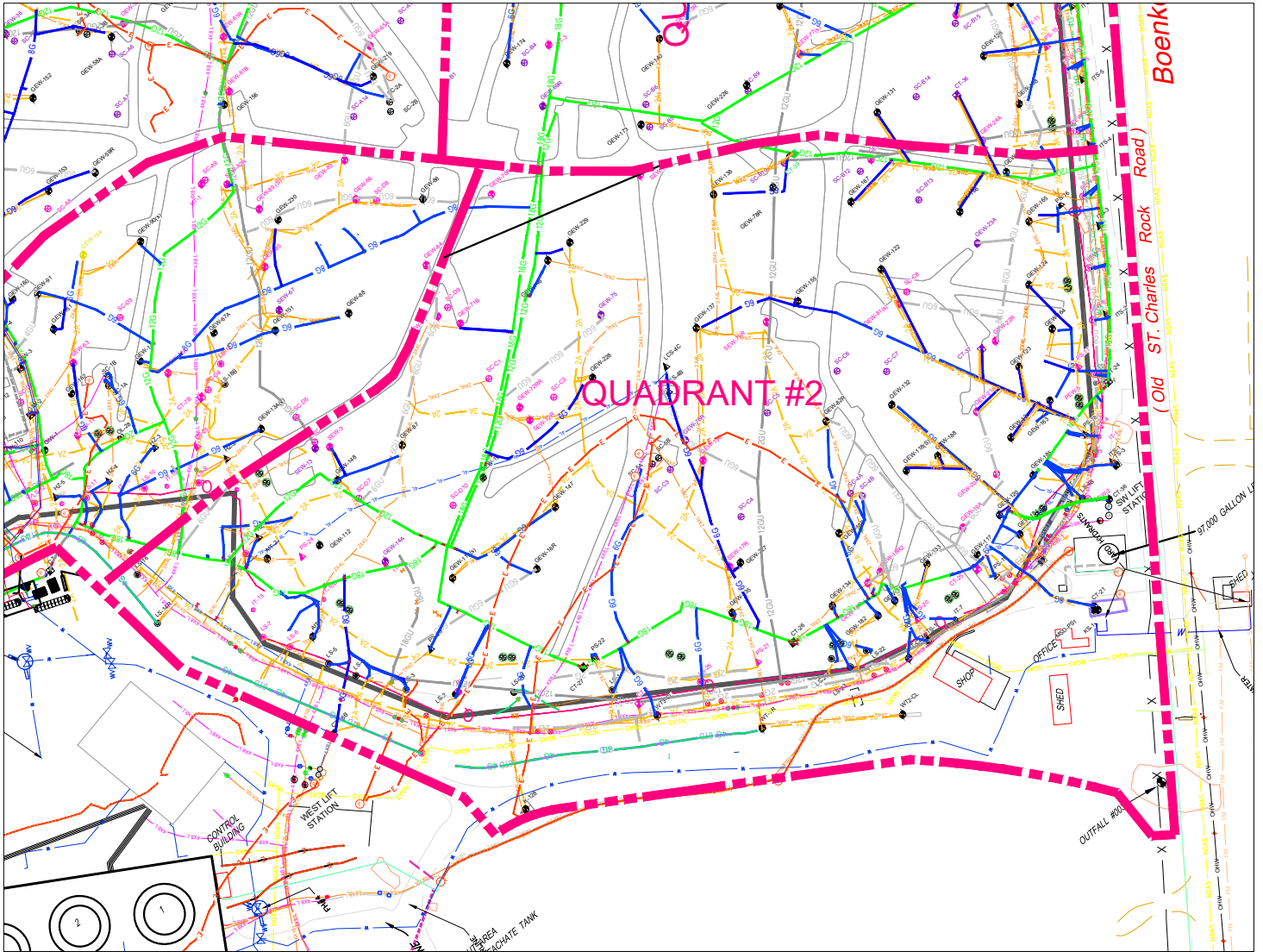
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BRIDGETON LANDFILL QUADRANT CHECKS

BLQ2-(DATE)_____

INSPECTOR NAME: _____

QUADRANT #2



REPAIRS:

ODORS:

PUMPS:

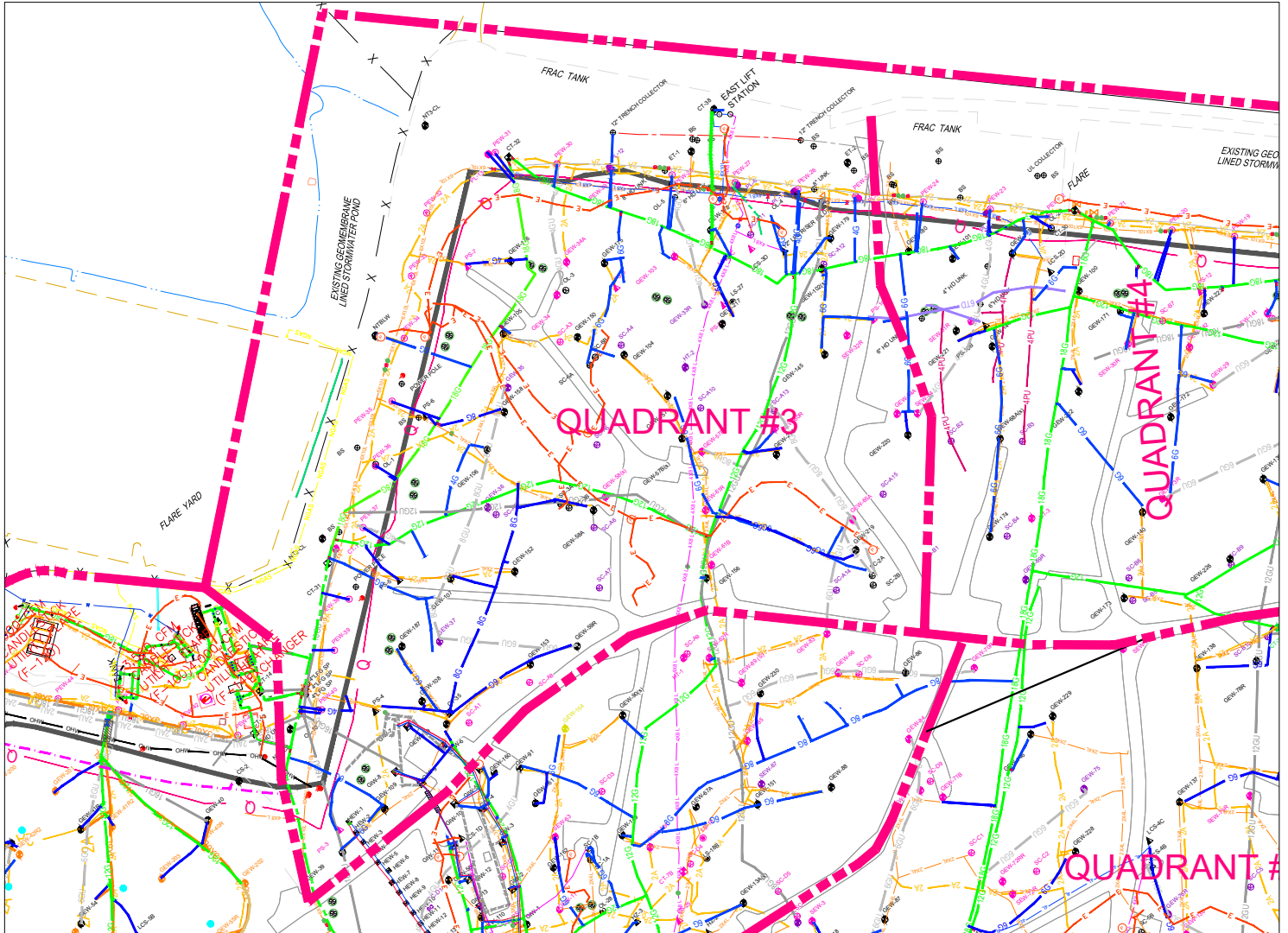
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BRIDGETON LANDFILL QUADRANT CHECKS

BLQ3-(DATE)_____

INSPECTOR NAME: _____

QUADRANT #3



REPAIRS:

ODORS:

PUMPS:

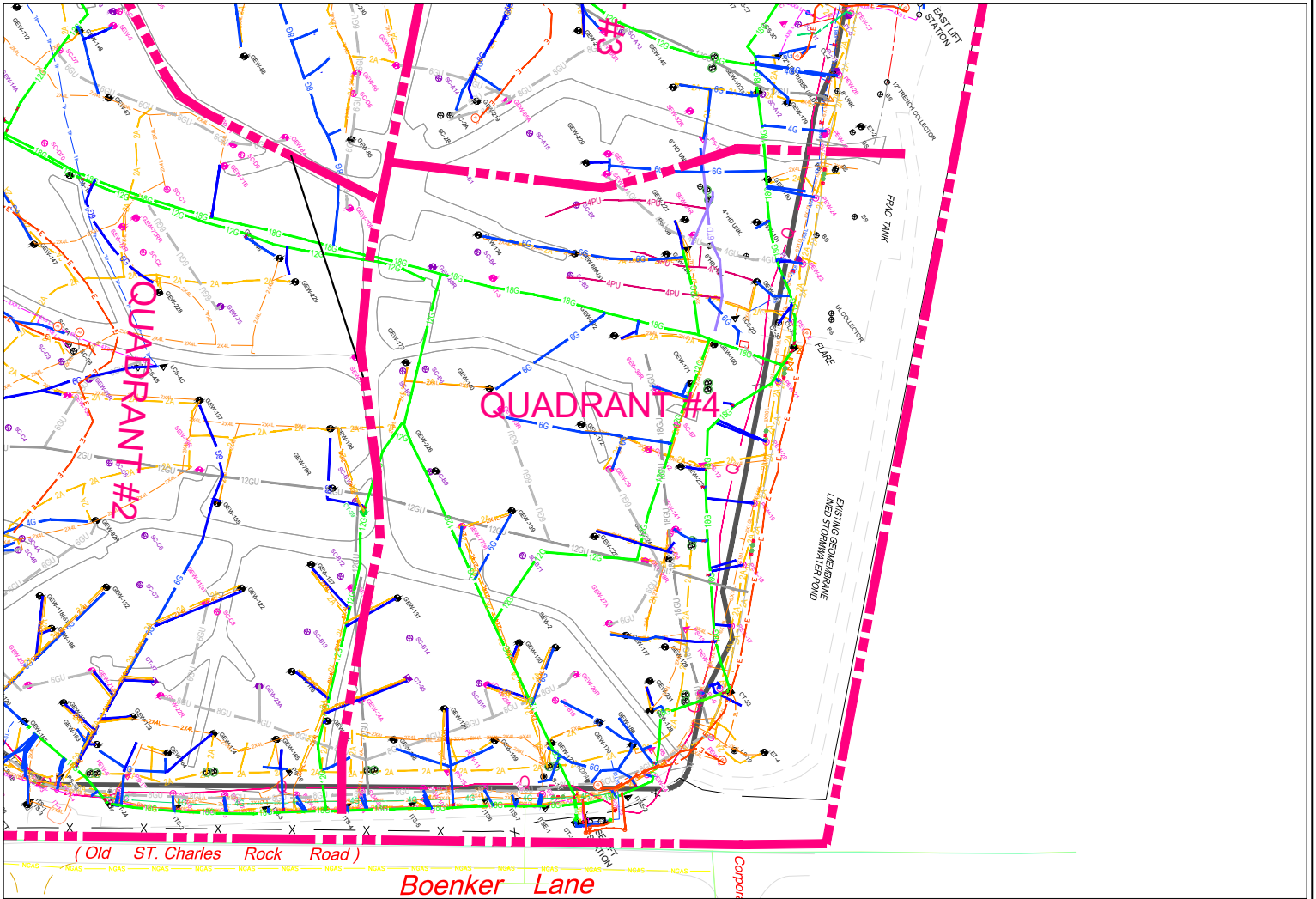
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BRIDGETON LANDFILL QUADRANT CHECKS

BLQ4-(DATE)_____

INSPECTOR NAME: _____

QUADRANT #4



REPAIRS:

ODORS:

PUMPS:

[illegible]

Bridgeton Landfill Perimeter Visual Inspection Form

TECHNICIAN: _____

DATE: _____

CHECK POINT	TIME	ODORS?	VISUAL INSPECTION	POINT "OK"	COMMENTS
SOUTH QUARRY STORM WATER POINTS					
North Ditch					
North Ditch Outfall 1					
East Ditch 1					
East Ditch 2					
East Ditch 2 Pump					
South Ditch					
SW Outfall Gate 1					
SW Outfall Gate 2					
West Ditch 1					
West Ditch 2					
West Ditch 3					
West Ditch 4					
West Ditch 5					
SOUTH QUARRY FACE CHECKS					
North Face					
East Face					
South Face					
West Face1					
West Face 2					
Top Hill					
NORTH QUARRY STORM WATER POINTS					
North East Ditch					
North Ditch					
NORTH QUARRY FACE CHECKS					
North Face					
East Face					
West Face					
SITE SECURITY CHECKS					
GATE 1					
GATE 2					
GATE 3					
GATE 4					
GATE 5					
GATE 6					
GATE 7					
OU-1 CHECKS					
AREA 1					
AREA 2					

COMMENTS: _____

Bridgeton Landfill Flare Compound & RTO Inspection Form

TECHNICIAN: _____

DATE: _____

MAIN FLARE YARD						
CHECK POINT	TIME	ODORS	VISUAL INSPECTION	VACUUM	TOTAL FLOW	COMMENTS
MAIN FLARE YARD						
LIQUID SEALS						
	TIME	WATER LEVEL	VISUAL INSPECTION	AUTO	OK	COMMENTS
Liquid Seal 100						
Liquid Seal 120						
Liquid Seal 140						
COMPRESSORS						
	TIME	OPERATING	VISUAL INSPECTION	TEMP	PSI	COMMENTS
Compressor #1 (Main)						
Compressor #2 (East)						
Compressor #3 (West)						
THERMAL OXIDIZERS						
	TIME	OPERATING	VISUAL INSPECTION	TEMP	Inlet Pressure	COMMENTS
RTO-1						
RTO-2						
Pretreatment Plant Tank Odor Control						
	TIME	PRESURE	VISUAL INSPECTION	Tank Level	COMMENTS	
TK-200						
TK-307A						
TK-307B						
TK-307C						
TK-307D						

COMMENTS: _____

Bridgeton Landfill GCCS Inspection Form

TECHNICIAN: _____

DATE: _____

**** Check air compressors and flare yard operations before proceeding with any of this****

STRUCTURES						
CHECK POINT	TIME	VACUUM	ODORS	VISUAL INSPECTION	POINT "OK"	COMMENTS
CT - 14						
CT - 13						
CT - 31						
North Trench Sump						
CT -32						
East Grit Chamber						
East Lift Station						
CT-30						
CT - 33						
SE Grit Chamber						
SE Lift Station						
CT - 24						
SW Grit Chamber						
SW Lift Station						
CT-21						
MSD PS-1						
CT-16B						
West Grit Chamber						
West Lift Station						
CT -17						
CT-81						
CT - 8B						
CT -9						
CT - 10						
CT - 11						
CT-12						
CT-18						

COMMENTS: _____

GAS EXTRACTION WELL - TYPICAL ASSEMBLY



TYPICAL QUAD CHECK CHECKLIST

- CONDITION OF PIPE
- ALIGNMENT OF PIPE
- TIGHTNESS OF BOLTS
- INDICATION OF LEAK
- INDICATION OF SPILL
- FUNCTION OF PUMP (IF PRESENT)
- CONDITION OF BOOT LINER/ NEO-PRENE SEAL
- CHECK VACUUM PORTS

CORRECTIVE ACTIONS

- * MAKE MINOR REPAIRS IMMEDIATELY IF POSSIBLE
- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR MAJOR CONCERNS
- * USE QUADRANT FORM TO RECORD ANY AND ALL ISSUES
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

GAS EXTRACTION WELL (WITH PUMP) - TYPICAL ASSEMBLY



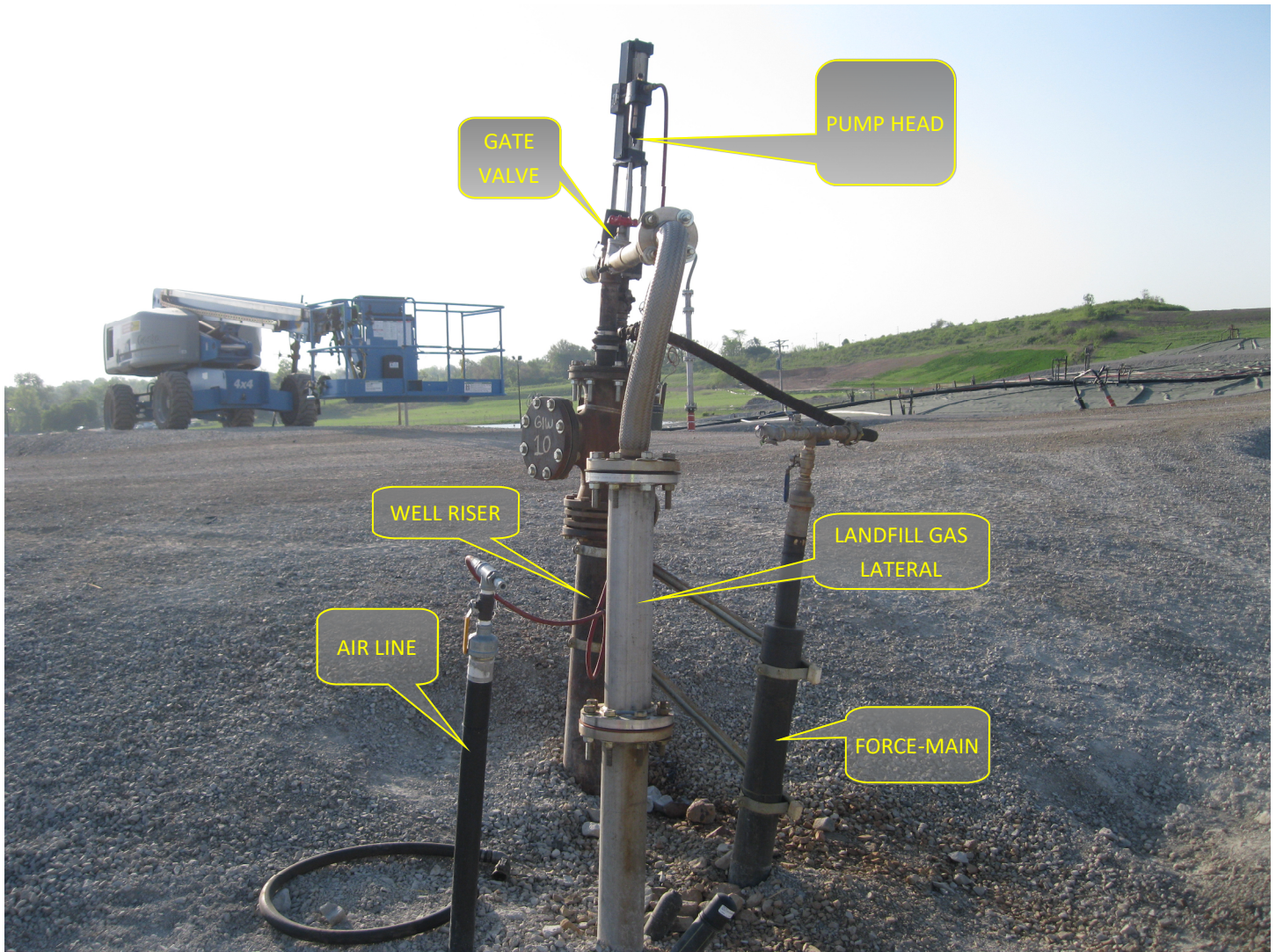
TYPICAL QUAD CHECK CHECKLIST

- CONDITION OF PIPE
- ALIGNMENT OF PIPE
- FLOW OF LEACHATE
- OPERATION OF PUMP
- INDICATION OF LEAK
- INDICATION OF SPILL
- CONDITION OF BOOT LINER/ NEO-PRENE SEALS
- CLAMPS SECURE
- CHECK VACUUM PORTS

CORRECTIVE ACTIONS

- * MAKE MINOR REPAIRS IMMEDIATELY IF POSSIBLE
- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR MAJOR CONCERNS
- * USE QUADRANT FORM TO RECORD ANY AND ALL ISSUES
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

GAS INTERCEPTOR WELL - TYPICAL ASSEMBLY



TYPICAL QUAD CHECK CHECKLIST

- CONDITION OF PIPE
- FLOW OF LEACHATE
- OPERATION OF PUMP
- INDICATION OF LEAK
- INDICATION OF SPILL
- CONDITION OF BOOT LINER (IF PRESENT)
- CHECK VACUUM PORTS

CORRECTIVE ACTIONS

- * MAKE MINOR REPAIRS IMMEDIATELY IF POSSIBLE
- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR MAJOR CONCERNS
- * USE QUADRANT FORM TO RECORD ANY AND ALL ISSUES
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

(CT-17) - TYPICAL ASSEMBLY



TYPICAL QUAD CHECK CHECKLIST

- CONDITION OF PIPE
- ALIGNMENT OF PIPE
- FLOW OF LEACHATE
- TIGHTNESS OF BOLTS
- OPERATION OF PUMP
- INDICATION OF LEAK
- INDICATION OF SPILL

CORRECTIVE ACTIONS

- * MAKE MINOR REPAIRS IMMEDIATELY IF POSSIBLE
- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR MAJOR CONCERNS
- * USE QUADRANT FORM TO RECORD ANY AND ALL ISSUES
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

LEACHATE SUMP - TYPICAL ASSEMBLY



TYPICAL QUAD CHECK CHECKLIST

- CONDITION OF PIPE
- ALIGNMENT OF PIPE
- TIGHTNESS OF BOLTS
- FLOW OF LEACHATE
- OPERATION OF PUMP
- INDICATION OF LEAK
- INDICATION OF SPILL

CORRECTIVE ACTIONS

- * MAKE MINOR REPAIRS IMMEDIATELY IF POSSIBLE
- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR MAJOR CONCERNS
- * USE QUADRANT FORM TO RECORD ANY AND ALL ISSUES
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

TEMPERATURE MONITORING PROBE - TYPICAL ASSEMBLY



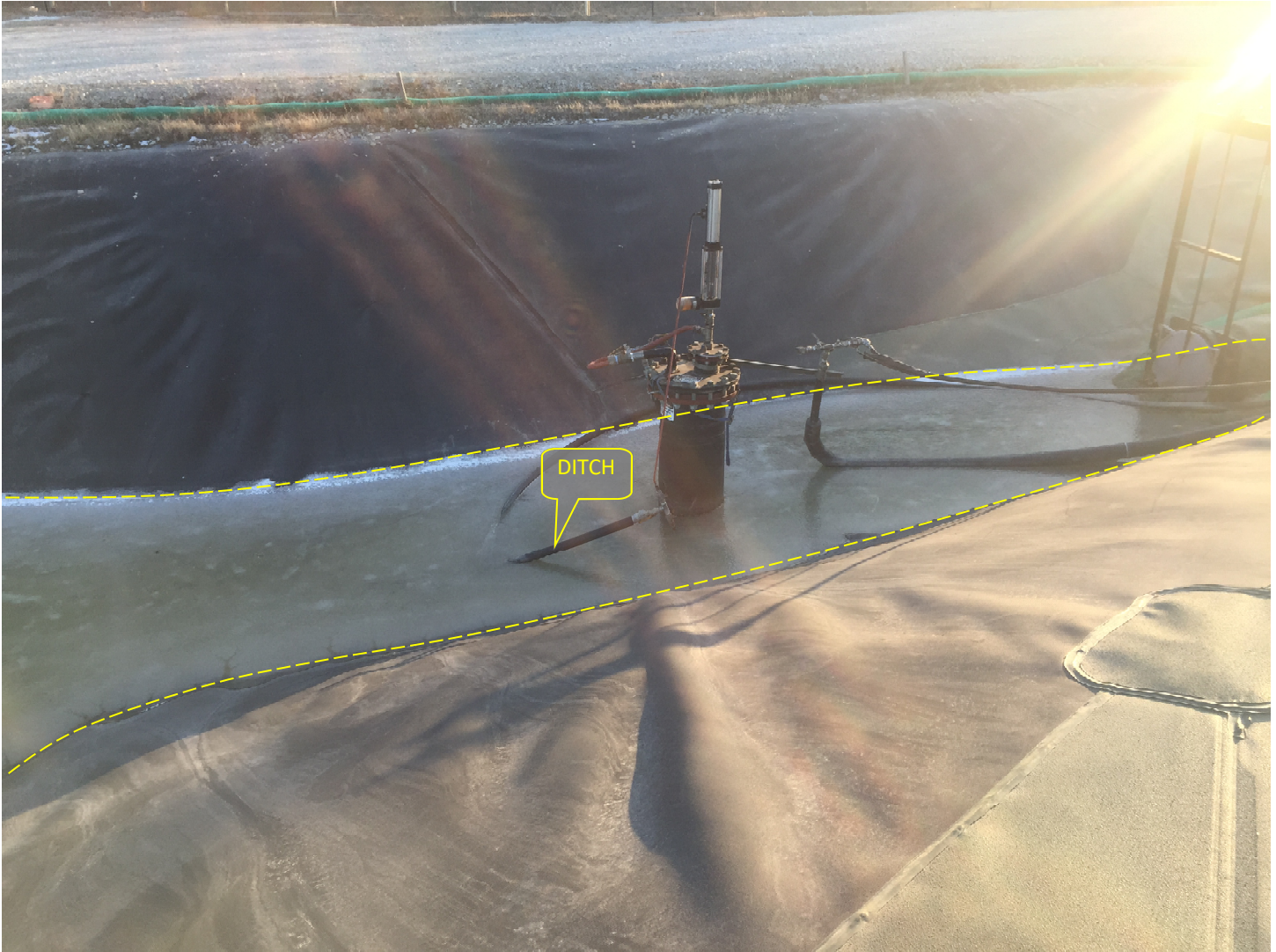
TYPICAL TEMPERATURE AND VOLTAGE RESISTANCE CHECK

- RECORD TEMPERATURES OF EACH THERMOCOUPLE LINE
- CHECK RESISTANCE (IN OHMS)
- CONDITION OF ACCESS PANEL INTERIOR

CORRECTIVE ACTIONS

- * MAKE MINOR REPAIRS IMMEDIATELY IF POSSIBLE
- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR MAJOR CONCERNS
- * USE FIELD FORM TO RECORD ANY AND ALL ISSUES
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

DITCHES AND LOW SPOTS - TYPICAL AREA



TYPICAL QUAD CHECK CHECKLIST

- INDICATION OF LEAK, OR SPILL
- NOTE IF DISCHARGE REQUIRED

CORRECTIVE ACTIONS

- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR EVIDENCE OF SPILLAGE
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

OUTFALLS - TYPICAL AREA



TYPICAL QUAD CHECK CHECKLIST

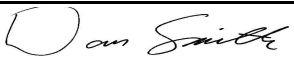
- INDICATION OF LEAK, OR SPILL

CORRECTIVE ACTIONS

- * IMMEDIATELY NOTIFY APPROPRIATE PERSONNEL OF ODORS OR EVIDENCE OF SPILLAGE
- * UPDATE THE MAIN WORK ORDER LIST WITH ALL MAJOR REPAIR ITEMS AND ISSUES THAT CANNOT BE ADDRESSED SAME DAY

APPENDIX B

SDS SHEETS FOR SYNTHETIC CAP MATERIAL

MATERIAL SAFETY DATA SHEET				QUICK IDENTIFIER (In Plant Common Name)			
Manufacturer's Name RAVEN INDUSTRIES INC. Address P.O. Box 5107 Sioux Falls, SD 57117				Absolute Barrier X40BAL X60BAL Emergency Telephone Numbers 800-635-3456 605-335-0174 Other Information 1813 "E" Avenue Sioux Falls, SD 57104			
Signature of Person Responsible for Preparation 				Date Prepared June 29, 2012			
Section 1 - IDENTITY							
Common Name: (Used on Label) (Trade Name & Synonyms) X40BAL X60BAL				CAS Number(s) 25213-02-9 1333-86-4 26221-27-2 9002-88-4			
Chemical Name Ethylene Vinyl Alcohol Copolymer Copolymer of Ethylene and Hexene				Chemical Family Polyolefin EVOH			
Formula (CH2 - CH2) n							
Section 2 - HAZARDOUS INGREDIENTS							
Principal Hazardous Component(s) - Chemical and Common Name(s)				%		Threshold Limit Value (units)	
None							
Section 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosion Data)							
Boiling Point		Not Applicable (N/A)		Specific Gravity		.920-.960	
Percent Volatile by Volume (%)		0		Vapor Density		N/A	
Solubility in Water		Insoluble in Water		Evaporation Rate		N/A	
Appearance and Odor		Black, odorless plastic film.		Reactivity in Water		Not Reactive in Water	
Flash Point		N/A		Flammability Limits in Air, by Volume (%)		Lower N/A Upper N/A	
Extinguisher Media		Use water spray, dry chemical, foam or carbon dioxide		Auto Ignition Temperature		> 650 F (estimated)	
Special Fire Fighting Proced.		Fire fighters should wear a self-contained breathing apparatus when there is a possibility of exposure to smoke, fumes or hazardous decomposition products. If possible, water should be applied as a spray from a fogging nozzle since this material is a surface burning material.					
Unusual Fire and Explosion Hazards		None					
Section 4 - PHYSICAL HAZARDS							
Stability		Unstable Stable X		Conditions to Avoid		Temperatures over 560 F will release combustible gases.	
Incompatibility (Materials to Avoid)		None					
Hazardous Decomposition Products		The following combustion products may be generated: Carbon dioxide, carbon monoxide, water vapor, and trace volatile organic compounds.					
Hazardous Polymerization		May Occur Will not Occur X		Conditions to Avoid		N/A	

Section 5 - HEALTH HAZARDS**Threshold** N/A**Limit Value****Signs and Symptoms of Exposure**

1. Acute	Not Determined	2. Chronic	Not Determined
Overexposure		Overexposure	

Medical Conditions Generally There are no known medical conditions aggravated by exposure to this product.**Aggravated by Exposure**

Chemical Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Not Listed	L.A.R.C. Monographs	Not Listed	OSHA	Not Listed
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OSHA Permissible Exposure Limit	None	ACGIH Threshold Limit Value	None	Other Expos. Limit Used	None
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Emergency and First Aid Procedures Most problems will result from exposure to molten materials.**1. Inhalation** Immediately remove victim from area to fresh air. Seek medical attention.**2. Eyes** If contacted by molten material, immediately flush eyes with plenty of cool water for at least 15 minutes. Do not permit victim to rub eyes. Immediately seek medical attention.**3. Skin** If contact by molten material, cool immediately with cool water. Do not attempt to remove any solidified material. Immediately seek medical attention.**4. Ingestion** If material is ingested, contact a physician or Poison Control Center as appropriate whenever any foreign object is swallowed.**Section 6 - SPECIAL PROTECTION INFORMATION****Respiratory Protection****(Specify Type)** N/A

Ventilation	Local Exhaust	Mechanical (General)	Special	Other
N/A	N/A	N/A	N/A	N/A

Protective Gloves	Wear protective gloves during thermal processing.	Eye Protection	Wear eye protection during thermal processing.
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Other Protective Clothing or Equipment Wear protective sleeves when processing material at elevated temperatures to minimize the possibility of thermal burns.**Section 7 - SPECIAL PRECAUTIONS AND SPILL / LEAK PROCEDURES****Precautions to be Taken****in Handling and Storage** This product should be stored in a manner that it is not exposed to heat and sources of ignition. A static charge may be present on finished products.**Other Precautions** None**Steps to be Taken in Case****Material is Released or Spilled** Spilled material should be swept up and discarded. Comply with applicable federal, state or local regulations.**Waste Disposal Methods** Dispose in accordance with local regulations**IMPORTANT - Do not leave blank spaces. If information is unavailable, unknown or does not apply, so indicate**

Section 1 – Product and Company identification

Product Name	WL Plastics Polyethylene Pipe		
MSDS #	WL131		
Product Description	Polyethylene Pipe (various colors, and with and without external color stripes, and with and without internal color layer)		
Product Use	Component for conveying gases, liquids and other fluid media		
Company Identification	WL Plastics Corporation 3575 Lone Star Cir, Ste 300 Fort Worth, TX 76177	Product Information:	1-435-867-8908
		Technical Information:	1-435-867-8908
		General Information:	www.wlplastics.com
24-Hour Emergency Telephone Number	CHEMTREC – 1-800-424-9300		

Section 2 – Composition / Information on Ingredients

INGREDIENT NAME	CAS NUMBER	AMOUNT
Polyethylene	9002-88-4	> 96% by weight
Polyethylene Hexene Copolymer	25213-02-9	> 96% by weight
Polyethylene Butene Copolymer	25807-34-7	> 96% by weight
May include carbon black	1333-86-4	0 - 4% by weight
May include flux calcined diatomaceous earth	68855-54-9	<1% by weight
May include crystalline silica (cristobalite)	14464-46-1	<1% by weight

Section 3 – Hazards Identification

Emergency Overview	Physical Appearance: <ul style="list-style-type: none"> Black polyethylene pipe Black polyethylene pipe with external longitudinal contrasting color stripes Black polyethylene pipe with contrasting internal color layer Polyethylene pipe is supplied in straight lengths or coils
Hazards of Product	<ul style="list-style-type: none"> This product is not a “Hazardous Chemical” as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. Injury or death can result from product falling from a height or unexpected movement during storage, unloading or handling. Call 1-435-867-8908 for unloading and handling instructions or obtain unloading and handling instructions from www.wlplastics.com. Product surface can be slippery especially if there is water, snow or ice on the surface. Do not walk on product. May contain an ingredient that can cause cancer. See Section 11. Not expected to be harmful if all recommendations in this MSDS are followed. See Section 7 and Section 8. EYE: Not expected to cause prolonged or significant eye irritation. If this material is heated, thermal burns may result from eye contact. SKIN: Contact with the skin is not expected to cause prolonged or significant irritation or cause an allergic skin response. If this material is heated, thermal burns may result from skin contact. INHALATION: Not expected to be harmful if inhaled. If this material is heated, fumes may be unpleasant and produce nausea and irritation of the upper respiratory tract. INGESTION: Not expected to be harmful if swallowed.

Section 4 – First Aid Measures

Eye contact:	Hot material: Flush eyes with plenty of cold water for at least 15 minutes. Do not remove contact lenses if worn. Seek medical assistance for mechanical removal of this material from the eye. The use of flush fluid, other than water, is not recommended. Cold material: Flush eyes with plenty of cold water. Get medical attention if irritation occurs.
Skin contact:	Hot material: If burned by contact with hot material, flush skin immediately with large amounts of cold water. If possible, submerge area in cold water. No attempt should be made to detach polymer adhering to the skin or to remove clothing attached with molten material. Thermal burns require immediate medical attention. Cold material: Wash with soap and water.
Inhalation:	If affected by fumes from heated material, remove from source of exposure and move the affected person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately.

Section 5 – Fire Fighting Measures

Flammability of the Product:	May be combustible at high temperatures.		
NFPA	Health: 0	Flammability: 1	Instability: 0
HMIS	Health: 0	Flammability: 1	Instability: 0
Auto-ignition temperature:	Greater than 343°C (649°F)		
Flash point:	Above 300°C (572°F) decomposition occurs and flash of fumes may occur.		
Products of combustion:	Products of combustion are carbon oxides (CO, CO ₂). May also contain low levels of aldehydes, ketones, organic acids or hydrocarbons.		
Unusual fire/explosion hazards:	High dust concentrations have a potential for combustion or explosion. This material is not explosive as defined by established regulatory criteria.		
Fire-fighting media and instructions:	In case of fire, use water spray (fog), foam or dry chemicals. Do not use water jet.		
Protective clothing (fire):	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.		

Section 6 – Accidental Release Measures

Protective measures:	Eliminate sources of ignition in vicinity of spilled material.
Spill management:	If heated material is spilled, allow it to cool before proceeding with disposal methods. Shavings, chips or segments from cutting and cooled, spilled heated material may cause a slipping hazard. Isolate and contain to prevent entry into sewers and waterways. Sweep or vacuum shavings, chips, segments and cooled heated material and place in appropriate containers for disposal. Recycle where possible. Use appropriate safety equipment.
Reporting:	USA regulations may require reporting spills of this material that could reach any surface waters. Report spills to local authorities and/or the National Response Center at (800) 424-8802 as appropriate or required.

Section 7 – Handling and Storage

Read and observe all precautions published in **WL101 Joining And Field Procedures For Pipe** and **WL111 Unloading Guidelines For WL Plastics Polyethylene Pipe**. Call 1-435-867-8908 to obtain copies of WL101 and WL111 or obtain copies from www.wlplastics.com.

Section 7 – Handling and Storage (continued)

- Precautionary measures:** Avoid heated material contact with eyes, skin and clothing. Avoid breathing vapor or fumes from heated material.
- Unusual handling hazards:** Potentially toxic / irritating fumes may evolve from heated material. At high temperatures, above 177°C (350°F), polyethylene can release vapors and gases that are irritating to mucous membranes of the eyes, mouth, throat and lungs. These substances may include acetaldehyde, acetone, acetic acid, formic acid, formaldehyde and acrolein. Based on animal data and limited epidemiological evidence, NTP, IARC (2A) and OSHA have listed formaldehyde as a probable human carcinogen. Following all recommendations within this MSDS should minimize exposure to thermal processing emissions.

Section 8 – Exposure Controls and Personal Protection

Exposure limits:	Component	Exposure Limits	Form
	Particulates (Insoluble) Not Otherwise Specified (PNOS)	10 mg/m3 TWA8 ACGIH	Inhalable fraction Particulate matter containing no asbestos and crystalline silica <1%
		3 mg/m3 TWA8 ACGIH	Respirable fraction Particulate matter containing no asbestos and crystalline silica <1%
		5 mg/m3 TWA8 OSHA	Respirable fraction
		15 mg/m3 TWA8 OSHA	Total dust
Personal protection:	Respiratory Protection:	Use NIOSH-Approved respirator if unable to control airborne dust, fumes and vapor.	
	Ventilation:	Local exhaust ventilation is recommended for control of airborne dust, fumes and vapor, especially in confined areas.	
	Other Protective Equipment:	Wear gloves and suitable eye protection.	
Engineering controls:	If dust is generated, provide local exhaust ventilation to keep exposure to airborne contaminants below exposure limits.		

Section 9 – Physical and Chemical Properties

Physical state and appearance:	Polyethylene pipe is supplied in straight lengths or coils as black polyethylene pipe, or black polyethylene pipe with external longitudinal contrasting color stripes, or black polyethylene pipe with contrasting internal color layer, or yellow polyethylene pipe, or yellow polyethylene pipe with external longitudinal contrasting color stripes.
Odor:	Negligible
pH:	NA
Vapor pressure:	NA
Vapor density (air = 1)	NA
Boiling point:	NA
Solubility (in water):	Insoluble in water
Melting point:	100 - 135°C (212 - 275°F)
Specific gravity:	0.93 – 0.99
Density:	0.93 – 0.99 g/cm ³

Section 10 – Stability and Reactivity

Chemical stability:	This material is considered stable under ambient temperature and pressure and normally anticipated storage and handling conditions.
Conditions to avoid:	Avoid heating above recommended processing temperature.
Incompatibility with other materials:	None
Hazardous decomposition products:	Carbon oxides
Hazardous polymerization:	Hazardous polymerization will not occur

Section 11 – Toxicological Information

Immediate Health Effects:

Acute oral toxicity:	LD50 / Not known
Acute dermal toxicity:	LD50 / Not known
Acute inhalation toxicity:	LD50 / Not known
Eye irritation:	Not expected to be irritating to the eyes.
Skin irritation:	Not expected to be irritating to the skin.
Sensitization:	Dermal – not a sensitizer / human
Additional toxicological information:	<ul style="list-style-type: none"> ○ This product contains POLYMERIZED OLEFINS. During thermal processing (>177°C; >350°F) polyethylene can release vapors and gases (aldehydes, ketones and organic acids) that are irritating to the mucous membranes of the eyes, mouth, throat, and lungs. Generally these irritant effects are transitory. However, prolonged exposure to irritating off-gases can lead to pulmonary edema. Formaldehyde (an aldehyde) has been classified as a probable human carcinogen by NTP, IARC (2A) and OSHA based on animal data and limited epidemiological evidence. ○ Pigments containing carbon black, lead chromate, nickel, antimony or titanium compounds may have been incorporated into this product. The International Agency for Research on Cancer (IARC) has classified carbon black as a Group B carcinogen (possibly carcinogenic to humans) based on sufficient evidence in animals and inadequate evidence in humans. However, the pigments in this product are bound in a polymer matrix that severely limits its extractability, bioavailability and toxicity. The lead chromate pigment is also silica-encapsulated as well as bound in a polymer matrix. None of these pigments is likely to cause adverse health effects under recommended conditions of use. ○ Product marked “NSF-61” is safe for use with potable water (drinking water for human consumption).

Section 12 – Ecological Information

Ecotoxicity:	This material is not expected to be harmful to aquatic organisms.
Environmental fate:	This material is not expected to be readily biodegradable.
Mobility:	This product has not been found to migrate through soils.
Persistence and degradability:	This product does not readily degrade. Under normal oxidation conditions, >99% of polyethylene will remain intact after exposure to microbial actions. Product will slowly change (embrittle) in the presence of sunlight, but will not fully break down. Product buried in landfill has been found to be stable over time. No toxic degradation products are known to be produced.
Other ecological information:	Wildlife may ingest waste cuttings, shavings, segments or chips. Although not toxic, such materials may physically block the digestive system, causing starvation or death.

Section 13 – Disposal Considerations

**Disposal consideration /
Waste information:**

Recycle to process if possible. Waste cuttings, segments, chips and shavings should be swept up or vacuumed and placed in appropriate containers for disposal and to avoid runoff into waterways. This product as manufactured is a non-hazardous waste but may become contaminated upon use. If this material must be discarded, depending upon use and application, it may meet the criteria as hazardous waste as defined by the US EPA under RCRA (40 CFR 261) or other State or Local regulations. Consult an environmental professional to determine if local, regional or national regulations would classify this material or contaminated material as hazardous waste. Use only approved transporters, recyclers, treatment, storage or disposal facilities. Dispose of in accordance with all applicable National, State, Provincial and Local regulations.

Section 14 – Transport Information

US DOT	Not regulated as hazardous material or dangerous goods for transportation.
ICAO /IATA	Not regulated as hazardous material or dangerous goods for transportation.
IMO / IMDG	Not regulated as hazardous material or dangerous goods for transportation.
RID / ADR	Not regulated as hazardous material or dangerous goods for transportation.
TDG	Not regulated as hazardous material or dangerous goods for transportation.
Other transportation information:	The description shown may not apply to all shipping situations. Consult appropriate Dangerous Goods Regulations for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

Section 15 – Regulatory Information

SARA 311/312 Categories:	Immediate (acute) health effects	No
	Delayed (chronic) health effects	No
	Fire hazard	No
	Sudden release of pressure hazard	No
	Reactivity hazard	No

Regulatory Status:

Country	Inventory	Status
Australia	AICS	All components are included or otherwise exempt from inclusion on this inventory.
Canada	DSL	All components are included or otherwise exempt from inclusion on this inventory.
Canada	NDSL	
China	IECS	All components are included or otherwise exempt from inclusion on this inventory.
European Union	EINECS	All components are included or otherwise exempt from inclusion on this inventory.
European Union	ELINCS	
European Union	NLP	
Japan	ENCS	All components are included or otherwise exempt from inclusion on this inventory.
Korea	ECL	All components are included or otherwise exempt from inclusion on this inventory.
Philippines	PICCS	All components are included or otherwise exempt from inclusion on this inventory.
United States	TSCA	All components are included or otherwise exempt from inclusion on this inventory.

Regulatory Lists:

01 = CA Prop 65

18 = FDA 179

35 = RCRA Waste P-List

Safety Data Sheet
WL Plastics Polyethylene Pipe
All Grades – All Colors – All Materials
MSDS #: WL131

Regulatory Lists (continued):

02 = LA RTK	19 = FDA 180	36 = RCRA Waste U-List
03 = MA RTK	20 = FDA 181	37 = SARA Section 311/312
04 = MN Hazardous Substance	21 = FDA 182	38 = SARA Section 313
05 = NJ RTK	22 = FDA 184	39 = TSCA 12 (b)
06 = PA RTK	23 = FDA 186	40 = TSCA Section 4
07 = CAA Section 112 HAPs	24 = FDA 189	41 = TSCA Section 5(a)
08 = CWA Section 307	25 = IARC Group 1	42 = TSCA Section 8(a) CAIR
09 = CWA Section 311	26 = IARC Group 2A	43 = TSCA Section 8(a) PAIR
10 = DOT Marine Pollutant	27 = IARC Group 2B	44 = TSCA Section 8(d)
11 = FDA 172	28 = IARC Group 3	45 = WHIMS - IDL
12 = FDA 173	29 = IARC Group 4	46 = Germany D TAL
13 = FDA 174	30 = NTP Carcinogen	47 = Germany WKG
14 = FDA 175	31 = OSHA Carcinogen	48 = DEA List 1
15 = FDA 176	32 = OSHA Highly Hazardous	49 = DEA List 2
16 = FDA 177	33 = RCRA Waste Appendix VIII	
17 = FDA 178	34 = RCRA Waste D-List	

The following components of this material are found on the regulatory lists indicated:

Polyethylene	4
May include: carbon black	1, 3, 4, 5, 6, 27, 45
May include: lead chromate pigment	1, 3, 4, 5, 6, 25, 26, 30, 34, 38, 39, 45, 46

CERCLA reportable quantities (RQ) / SARA 302 threshold planning quantities (TPQ):

Component	Component RQ	Component TPQ	Product RQ
May include: lead chromate pigment	10 lbs	None	1000 lbs

WHMIS Classification:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

Section 16 – Other Information

Notice to reader:

NOTICE: This Material Safety Data Sheet is based on data considered to be accurate at the time of its preparation, but despite our efforts, it may not be up to date or applicable to the circumstances of any particular case. The information on this MSDS was obtained from sources that we believe are reliable. However, the information is provided without warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself. The conditions or methods of handling, storage, use and disposal are beyond our control and may be beyond our knowledge. For this and other reasons, WL Plastics does not assume responsibility and expressly disclaims liability for loss, damage, injury or expense arising out of or in any way connected with handling, storage, use or disposal of this product, or resulting from abnormal use, or resulting from any failure to follow appropriate practices, or from hazards inherent in the nature of the product. If the product is used as a component in another product or system, this MSDS information may not be applicable.

< End of MSDS >

APPENDIX C

CRACK AND VOID REPAIR

Appendix C

Crack and Void Repair

Alternative 1 – Compacted Soil Backfill

1. Construct road and pad(s) on cap to provide dump truck and equipment access to the repair area;
2. Turn off subcap gas collectors in the vicinity of the repair area;
3. Cut cap flexible membrane liner (FML) at least five feet beyond limit of void in a manner what will allow material to be re-folded when complete;
4. If necessary, install a portable odor control unit near the repair site, and install a 1,500 gallon water tank on a suitable pad;
5. Conduct necessary backfilling. A rigid plate may be used with backfill to bridge soft areas;
6. Use odor control neutralizers at a suitable concentration during the backfilling process. The concentration can be adjusted as necessary to achieve acceptable neutralization and to more fully neutralize aggressive odors;
7. Adjust concentrations and nozzle spacing as necessary during the activities to neutralize the odors;
8. During the backfill process, the neutralization process can be discontinued once more permanent landfill gas extraction methods are employed in this area; otherwise maintain neutralization until backfill is completed;
9. Re-fold the FML material to cover the backfilled area; and
10. Using cap strips as necessary, fuse FML together to restore complete cap in the work area.

The dry fill component will consist of materials meeting the clean fill definition in 260.200.1(6) RSMo. The material would be fine with a maximum of medium sand-sized particles, minimizing potential for abrasion damage to the FML.

Alternative 2 – Placement of Flowable Fill Material

The objectives for flowable fill repairs are as follows:

- Fill the cracks/voids so that the synthetic cap is supported at all places;
- Result in a fill that is malleable so that it provides seal during future deformations with a low- to medium-strength clay consistency and an expected permeability in the range of 1×10^{-5} cm/s;
- Allow re-excavation and removal of material if needed in future,
- Create a subcap surface that supports foot and vehicle traffic
- Minimize damage to the FML; and
- Minimize odors during the performance of the repair.

Flowable fill would be used only for small “spot-treatment” applications (approx. 50 CY). A typical crack, as observed during soil filling of previous cracks, may be about 50 feet long and two feet deep requiring about 8 cubic yards (CY) of flowable fill. A typical void around a well casing, like those observed during the February 2014 inspection and documented in Area of Concern 1, would be about six feet diameter and five feet deep requiring about 2 CY of fill.

The contractor’s proposed approach is as follows:

Appendix C

Crack and Void Repair

1. Position small pneumatic tanker with dry fill component on suitable perimeter access road or main corridor landfill access road;
2. Add potable water to the dry fill material to create slurry of desired consistency in the tanker (no air will be deliberately entrained);
3. Position grout pump between the tanker and the target crack/void;
4. Cut a small incision in the FML to allow insertion of grout hose;
5. Position grout hose through incision and as far into crack/void as possible;
6. Pump flowable fill in while retracting grout hose until void is full; and
7. Repair the incision in the FML with extrusion welding techniques, applying patches as necessary.

It may be necessary to create bulkheads to prevent fill from flowing downhill or into undercap drains or other areas where it is not desired. Sand bags or tubes, plywood barriers, and other means will be employed as necessary for this purpose. Locations of use will have to exclude those areas where there is potential to enter collection systems, clog, or negatively impact leachate removal. In addition, voids around well casings will likely require addition of bentonite pellets in the bottom of the void to create seal prior to application of flowable fill. Prior to filling we will identify the screen location of a well so that the repairs will not compromise well operation.

Alternative 2 has many advantages over Alternative 1 including preservation of cap integrity, reduction of the amount of road building, which can be damaging to the FML, and greatly reducing the potential for odors generated during the work due to the ability to avoid exposing the void.

If, at any time, a subsidence feature results in noticeable release of gas or odor, it will be repaired as quickly as practicable. Typically, however, these settlement features and cracks are well-contained by the FML, so Bridgeton Landfill will allow several of these voids to occur, and then schedule a repair contractor so that they can be accomplished together. This works well for smaller voids for which safety hazards can be avoided and which can be controlled to prevent release of gas or liquid, or any potential increase in odor. These bundled repair events allow efficient mobilization of necessary resources and minimization of duration of invasive work. In advance of completing repairs of identified subsidence features, the site team will review the landfill surface generally to identify any additional features that may require repair.

APPENDIX D

FILLING PROCEDURES FOR LARGE SETTLED AREAS

Appendix D

Filling Procedures for Large Settled Areas

The Bridgeton Landfill will complete clean fill projects as needed to promote positive storm water drainage and maintain above-ground piping infrastructure in the South Quarry of the Landfill. Due to the significant amount of differential settlement in the South Quarry of the Bridgeton Landfill, periodic clean fill projects are needed to maintain desirable topographic grades.

The selection of clean fill locations will be determined by the Bridgeton Landfill staff. The initiation of clean fill projects will be based on the differential settlement realized in the South Quarry of the Bridgeton Landfill. This determination will be made based on the ability to manage storm water and above-ground piping infrastructure.

The design for clean fill projects in the South Quarry will be specific, and somewhat unique, to each area needing clean fill. Therefore, a conventional approach to clean fill projects has been included in this section. The conventional approach will allow for general design parameters to be implemented at unique/different locations.

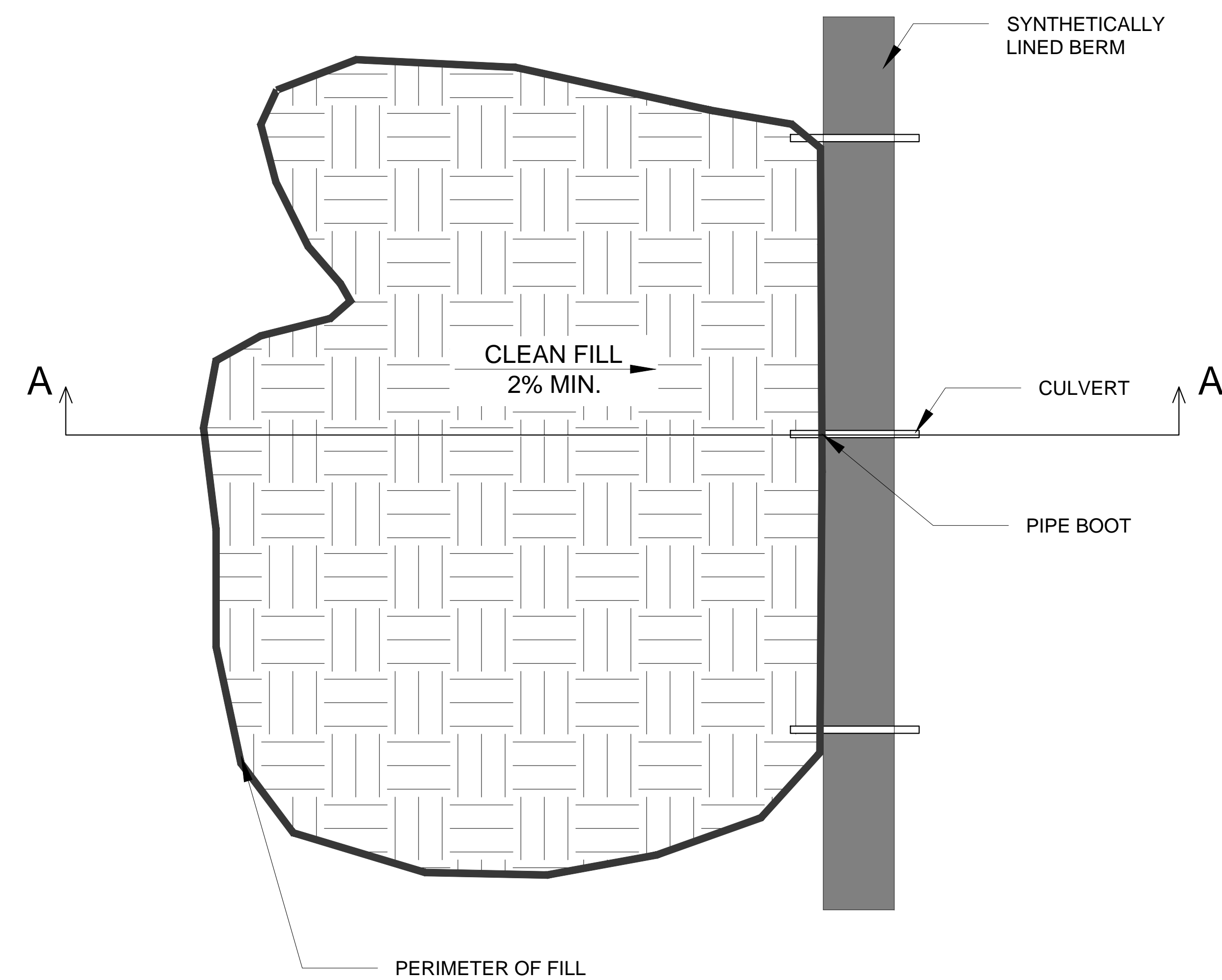
The customary design parameters shall include the following: procurement and placement of soil, sediment management, storm water and sedimentation controls, grading, vertical and horizontal infrastructure management and odor management procedures. The clean fill material will be obtained from a permitted borrow area north east of the South Quarry or from off-site locations. Off-site clean fill material will be secured and placed pursuant to the Clean Fill Permit Modification approved by SWMP on June 19, 2015 and St. Louis County Department of Health on July 22, 2015. A lined berm with booted-culvert pipes or cut sections will be constructed to control sediment. The soil grading will direct drainage to the culverts or cut-sections in the berm which will be protected by siltation control structures. This will allow sediment to be managed within the berm limits. Grading will be completed at a typical 2% grade sloping from the center of the South Quarry down to the outer lined berm. The grading will be completed to promote positive storm water drainage, reduce potential for ponding and support positive condensation drainage within the landfill gas headers in the respective area. The above-ground header piping and vertical infrastructure components will be modified to accommodate the proposed clean fill grades. All work will be completed in a manner to minimize the potential for odor during and post clean fill placement.

In accordance with the conditions for approval of the above referenced Clean Fill Permit Modification Bridgeton Landfill will observe the following conditions:

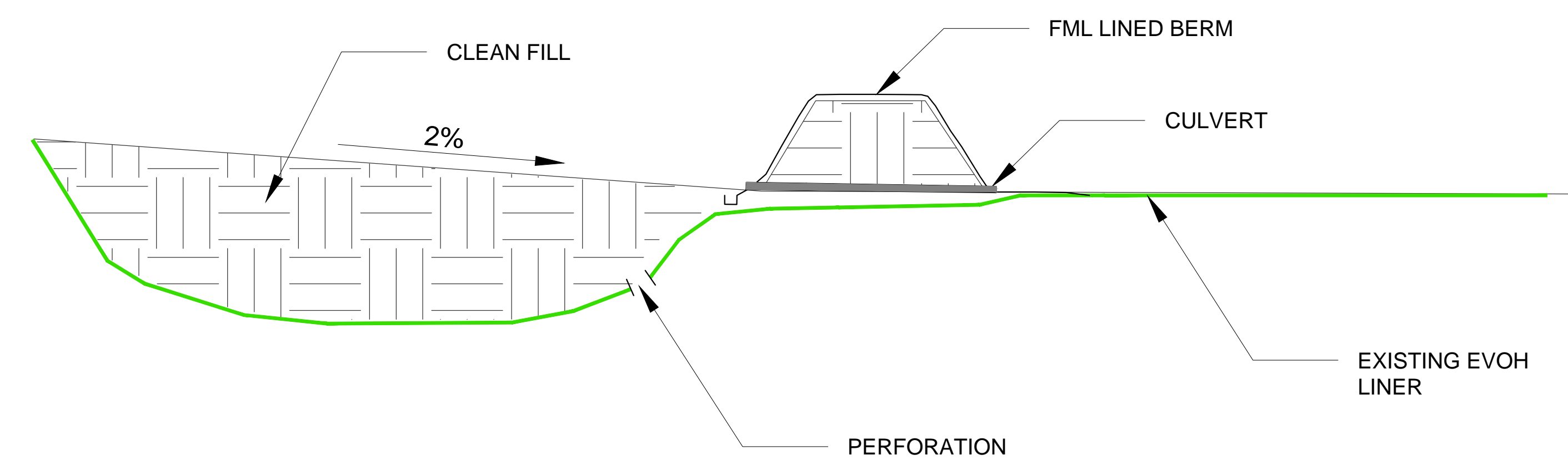
1. Notification is to be provided to the St. Louis County Department of Health at least 14 days prior to initiating any clean fill operations. Missouri Department of Natural Resources Solid Waste Management shall be notified at least 24 hours prior to commencement of large fill projects.
2. The Bridgeton Landfill Odor Management Plan will be followed at all times during clean fill operations.
3. Sufficient amounts of fine-grained soil and EVOH material will be available on-site prior to initiating clean fill operations. In the event that Odor Management Plan mitigation

efforts are insufficient for odor control fine-grained soil may be used as a first mitigation effort, followed by EVOH if necessary to sufficiently control/contain odor.

4. Painted block, brick, concrete, or asphalt shall be tested and determined to be clean fill prior to use.
5. Storm water controls shall be installed on bare soil fill and placement areas and any erosion shall be repaired immediately.
6. At least monthly a report to the department shall list all areas receiving clean fill, the number of cubic yards used in each area to date, whether a gravity drain feature or a sump was used/planned, and a drawing showing locations of current projects. All completed fill areas shall be clearly identified on the quarterly as-built drawings




PLAN VIEW



SECTION A-A

NOTE:

- 1.) DRAINAGE COLLECTION ON TOP OF EXISTING EVOH TO BE DETERMINED ON EACH PROJECT.

BRIDGETON LANDFILL, LLC 13570 ST. CHARLES ROCK ROAD BRIDGETON, MISSOURI 63044	BRIDGETON LANDFILL		Engineering for a Better World FEEZOR ENGINEERING, INC.	DECEMBER 2015	
				DESIGNED BY: DMK	
				APPROVED BY: ALK	
CLEAN FILL DETAIL					
PROJECT NUMBER: BT-089 FILE PATH:				REVISION	DATE

APPENDIX E

TEMPERATURE MONITORING PROCEDURE

Procedures for Verification of TMP Readings

General

The strings of T type thermocouples at the site are quality controlled strings of thermocouple 20 gauge Copper/Constantan thermocouple wire, with factory fabricated sealed junctions at the ends in the ground. The resistance of the wire, in ohms per foot, is 0.298. The thermocouple wire is coated with Teflon, which provides protection up to 500 °F. The thermocouple itself is rated to 750 °F. At the ground surface the thermocouple wires (two per thermocouple unit within the TMP location) are connected to a rotary switch or dedicated depth internal terminal that is inside a NEMA weatherproof rated enclosure mounted above the ground surface. A readout device, purchased from Omega Engineering of the HH800 series is connected to the rotary switch to take readings. Resistance readings can also be taken for each unit through the appropriate terminal, which is low resistance. Temperature readings are actually voltage differences across the two sides of the thermocouple wire and are read to the nearest microvolt to achieve readings accurate to ± 2 °F

Potential Problem in Obtaining Accurate Readings

The following things can result in poor quality readings

1. Not setting the thermocouple readout device to the correct setting. The device must be set to a type T thermocouple type. Failure to have the correct setting results in very different temperatures being associated with the voltage difference being converted by the readout device to temperature.
2. Not have clean connectors to the leads to the switch. This increases the resistivity at the readout end and can lead to erroneous readings. Make sure the contact surfaces are clean and dry.
3. Condensate or corrosion can occur within the rotary switch. This results in incorrect readings by raising resistance or even providing continuity across multiple thermocouples. The enclosure containing the switch must be well ventilated and dry. If condensate or corrosion is present the switch can be cleaned or replaced. Resistance readings at periodic intervals and whenever questionable readings are obtained can identify these problems.
4. Damage associated with abrasion or stretching or breaking of the thermocouple wire or its insulation can occur. This will result in either resistance that exceeds the nominal values foot of wire due to work hardening of the wire, very high resistance due to wire breakage or very low resistance do to insulation damage at shallower depth than the tips. Resistance readings at periodic intervals and whenever questionable readings are obtained can identify these problems.

Appendix E

Reading Verification

Verify Resistance

Resistance readings should be taken at monthly intervals for each thermocouple probe. A multimeter calibrated with a quality resistor of 50 ohm should be used. Additional readings should be taken whenever readings appear questionable or a large change in readings occurs. Values will be plotted with depth and units exceeding 1.3 times the theoretical resistance are considered marginal. Units with 1.65 times the nominal resistance values, corrected for the switch, will be considered unacceptable for use.

If readings are high, the switch unit should be inspected and the resistance at the thermocouple lead (for one or two units that read high) be checked bypassing the switch. If the switch is seen to be the issue it should be cleaned or replaced to reduce the measured resistance in the switch to a few ohms or less.

Verifying Readings

If the resistance readings are acceptable, the temperature readings should be repeated within 24 hours to identify they are representative. This verification should include double checking the readout is set to the correct thermocouple type.

Identifying Unacceptable Readings

Readings that do not stabilize to within 4 degrees over a period of 30 seconds and show rapid fluctuation are not acceptable and should be indicated as readings failed to stabilize. For existing leads, if issues are noticed with the data including change in temperature or resistance or resistance readings not expected pursuant to thermocouple length, we would remove the wires from the box (rotary switch or plug-in panel) and measure directly on the two wires. This eliminates any source interference above the ground. If the data is still not in the acceptable range, it would be determined that the issue is below ground and the thermocouple is compromised.

APPENDIX F

EXAMPLE WEEKLY DATA SUBMITTAL

Bridgeton Landfill, LLC

Weekly Data Submittals

Contents:

Attachment A – Temperature Monitoring Probe Analytical Charts

Attachment B – Leachate Levels in Leachate Collection Sumps

Attachment C – Work Completed/Planned

Provided Separately:

- Leachate Level in Leachate Collection Sump Raw Data Excel Spreadsheet
- Temperature Monitoring Probe Raw Data Excel Spreadsheet
- Heat Extraction System TMP Raw Data Excel Spreadsheet

Date: _____

APPENDIX G

EXAMPLE MONTHLY DATA SUBMITTAL

Bridgeton Landfill, LLC

Monthly Data Submittals

Contents:

Commentary on Data (optional)

Attachment A Daily Flare Monitoring Data

- A-1 Flow Data Table
- A-2 Flow Data Graphs

Attachment B Well Condition/Status Update

Attachment C Laboratory Data

- C-1 Lab Analyses Summary
- C-2 Lab Analyses Reports

Attachment D Gas Wellfield Data

- D-1 Wellfield Data Table
- D-2 Maximum Wellhead Temperature Table

Attachment E Settlement Front Map

Attachment F Liquid Characterization Data and Discharge Log

Attachment G Volumes of Leachate Processed

Provided Separately:

- Flare Raw Data Excel Spreadsheet
- Gas Wellfield Raw Data Excel Spreadsheet

Date: _____

APPENDIX H

RECORD OF DOCUMENT REVISIONS

BRIDGETON LANDFILL

Operation, Maintenance, and Monitoring Plan

[illegible]

APPENDIX I

SETTLEMENT VOLUME

Daily Settlement Volume (CY)

